
BULLETIN

of the

Chicago Herpetological Society



Volume 52, Number 2
February 2017



BULLETIN OF THE CHICAGO HERPETOLOGICAL SOCIETY

Volume 52, Number 2

February 2017

Notes on Mexican Herpetofauna 29: Association of Herpetofauna with Sotols and Beargrasses in the State of Nuevo León, Mexico	David Lazcano, Ricardo Quirino-Olvera, Manuel Nevárez de los Reyes and Javier Banda-Leal	17
Book Review: <i>Amphibians of Costa Rica: A Field Guide</i> by Twan Leenders	Martha L. Crump	27
A Monstrous Halloween Treat	Roger A. Repp	28
Minutes of the CHS Board Meeting, December 16, 2016		36
Minutes of the CHS Board Meeting, January 13, 2017		36
Herpetology 2017		37
Advertisements		38
News and Announcements: 2017 CHS Grant Recipients		39
News and Announcements: Show Schedule		40

Cover: A Gila monster, *Heloderma suspectum*, greets the world with style. Image by Dianna Repp, 30 October 2016.

STAFF

Editor: Michael A. Dloogatch—mdloogatch@chicagoherp.org

2017 CHS Board of Directors

President: Rich Crowley
Vice-president: Jessica Wadleigh
Treasurer: Andy Malawy
Recording Secretary: Gail Oomens
Media Secretary: Morgan Lantz
Membership Secretary: Mike Dloogatch
Sergeant-at-arms: Mike Scott
Members-at-large: Dan Bavrisha
 Lisette Chapa
 Linda Malawy
Immediate past President: John Bellah

The Chicago Herpetological Society is a nonprofit organization incorporated under the laws of the state of Illinois. Its purposes are education, conservation and the advancement of herpetology. Meetings are announced in this publication, and are normally held at 7:30 P.M., the last Wednesday of each month.

Membership in the CHS includes a subscription to the monthly *Bulletin*. Annual dues are: Individual Membership, \$25.00; Family Membership, \$28.00; Sustaining Membership, \$50.00; Contributing Membership, \$100.00; Institutional Membership, \$38.00. Remittance must be made in U.S. funds. Subscribers outside the U.S. must add \$12.00 for postage. Send membership dues or address changes to: Chicago Herpetological Society, Membership Secretary, 2430 N. Cannon Drive, Chicago, IL 60614.

Manuscripts published in the *Bulletin of the Chicago Herpetological Society* are not peer reviewed. Manuscripts should be submitted, if possible, on IBM PC-compatible or Macintosh format diskettes. Alternatively, manuscripts may be submitted in duplicate, typewritten and double spaced. Manuscripts and letters concerning editorial business should be sent to: Chicago Herpetological Society, Publications Secretary, 2430 N. Cannon Drive, Chicago, IL 60614. **Back issues** are limited but are available from the Publications Secretary for \$2.50 per issue postpaid.

Visit the CHS home page at <<http://www.Chicagoherp.org>>.

The Bulletin of the Chicago Herpetological Society (ISSN 0009-3564) is published monthly by the Chicago Herpetological Society, 2430 N. Cannon Drive, Chicago IL 60614. Periodicals postage paid at Chicago IL. **Postmaster:** Send address changes to: Chicago Herpetological Society, Membership Secretary, 2430 N. Cannon Drive, Chicago IL 60614.

Notes on Mexican Herpetofauna 29: Association of Herpetofauna with Sotols and Beargrasses in the State of Nuevo León, Mexico

David Lazcano¹, Ricardo Quirino-Olvera², Manuel Nevárez de los Reyes¹ and Javier Banda-Leal¹

Abstract

To increase our knowledge of herpetological activity associated with various plant communities, including the sotols and beargrasses, we visited several different sites throughout Nuevo León: Casa Blanca Canyon; San Isidro Canyon; Sierra de Gomas; Potrero Chico Canyon; Ejido Santa Rita; Sierra San Antonio Peña Nevada. In our state seven species of sotols have been documented: *Dasyllirion berlandieri*, *D. cedrosanum*, *D. miquihuanense*, *D. quadrangulatum*, *Nolina cespitifera*, *N. hibernica* and *N. nelsonii*. We found a close relationship between the sotols and herpetological activity; we also found that in most areas sotols form ecotones with other plant communities, including gypsophyllous, piedmont, rosetophilous, xeric scrub, oak and pine–oak forests. As sotols age their falling stems provide not only refuge, but also space for foraging and thermoregulation / basking. We detected 21 herpetological species in association with sotols and beargrasses, mostly where they form ecotones with other rosetophilous species, or with chaparral, oak or pine forest.

Resumen

En un intento por incrementar el conocimiento de la actividad herpetológica en las distintas especies de sotols, se visitaron diferentes sitios como: Cañón de Casa Blanca, Cañón San Isidro, Sierra de Gomas, Cañón de Potrero Chico, Ejido Santa Rita, y Sierra San Antonio Peña Nevada, Nuevo León, México. En el estado se ha documentado la distribución de 7 especies de sotols: *Dasyllirion berlandieri*, *D. cedrosanum*, *D. miquihuanense*, *D. quadrangulatum*, *Nolina cespitifera*, *N. hibernica* and *N. nelsonii*. Aquí encontramos una íntima relación con algunos sotols y la actividad herpetológica, además encontramos que los sotols forman ecotones con otras comunidades vegetales como matorrales gipsico, submontano, rosetophilous, xerófilo, bosques de encino and pino. Al envejecer los sotols y caer las hojas no solamente proporcionan refugio, sino sitio para forrajear o termoregular. Aquí detectamos 21 especies herpetológicas activas en esta comunidad rosetófilo, que en la mayoría de las localidades forman ecótonos.

The sotols and beargrasses belong to the family Nolinaceae, which includes the genera *Beaucarnea*, *Dasyllirion* and *Nolina*. They are distributed throughout the southern US states and down through Mexico to Guatemala and Belize (Trelease, 1911). The family includes 61 taxa (Bogler, 1994, 1998; Hochstätter, 2010; García-Mendoza et al., 2012; Rojas-Piña et al., 2014); there are 53 species in Mexico of which 41 species are endemic (Espejo, 2012; Rivera-Lugo and Solana, 2012). Sierra-Tristán et al. (2008) documented the sotols of Chihuahua. In Nuevo León four species of *Dasyllirion* and three species of *Nolina* have been recorded (Quirino-Olvera, 2015).

The plants in this family are rosetophilous, found in ecosystems with secondary growth vegetation. They may show semi-arboreal or arboreal development; as occurs in several species of *Nolina* and *Beaucarnea*. The stem is usually semi-woody, occasionally with caudex (swollen trunk) development, and may measure just a few centimeters or up to seven or eight meters. Leaves may be linear or may show a bulbous tip ending in a tuft, straight or curving downward. The shiny, light brown petiole is modified—flared and shaped similar to a spoon. It serves to hold sugars, important for flowering. The inflorescence is a

panicle and terminal and dense in *Dasyllirion*, whereas in *Nolina* and *Beaucarnea* it is open with white or cream-colored unisexual flowers. The fruit is a three-winged samaroid capsule, unilocular with a single seed in *Beaucarnea* and *Dasyllirion*, and trilocular with inflated papery carpels only in *Nolina*; usually three seeds develop, but only one is fertile.

The inflorescences attract many species of Diptera and Hymenoptera and a few Coleoptera, which are the main pollinators. Seeds do not seem to be consumed by any animal, but there is a small beetle that consumes the seed in its larval stage. Bears tend to damage plants to remove the stems and chew them, looking for stored sugar (in *Dasyllirion* and *Nolina*). Some of these plants are known to be used for refuge by several species of ants, rodents, snakes and various insects (Bogler, 1994).

Plants of this family typically grow in rocky soils on 4% to 24% slopes. They are almost always sympatric with plants of the genera *Yucca* and *Agave* (Castillo-Quiroz and Cano-Pineda, 2005; Treviño-Carreón et al., 2012), forming large communities, especially in areas that have suffered extreme wildfires and where primary vegetation has been eliminated by natural or

1. Universidad Autónoma de Nuevo León, Facultad de Ciencias Biológicas, Laboratorio de Herpetología, Apartado Postal # 513, San Nicolás de los Garza, Nuevo León, C.P. 66450 México.

2. Universidad Autónoma de Nuevo León, Facultad de Ciencias Biológicas, Laboratorio Botánica, Apartado Postal # 513, San Nicolás de los Garza, Nuevo León, C.P. 66450 México.

human promoted fires. These communities are found mainly in chaparral, piedmont, rosetophilous and other xerophytic scrub communities, also in dry deciduous forests or temperate forests.

Uses by Humans

Sotols and beargrasses were and still are used to make hand-crafted baskets by several indigenous cultures of northern Mexico and the southwestern United States. Some species of *Nolina* are industrially exploited; their fall-apart leaves or stems are mainly used to make brooms. The alcoholic beverage called sotol is made from *Dasyilirion*, and in addition ranchers today use *Dasyilirion* stems as a source of food for livestock in times of drought (Delfin, 2005). The seeds of some species of *Nolina* are also used in this fashion. In pre-Hispanic times sotols also were regularly consumed by the native hunter-gatherers. The base of the leaves and stems were eaten in a stew.

Species found in Nuevo León

Dasyilirion berlandieri Watson, 1879 (Blue Giant Sotol). This common plant is found throughout the Sierra Madre Oriental on the eastern slopes, in association with xeric scrub such as gypsophyllous, rosetophilous, Piedmont, and oak-pine forests, accumulating in sunny cleared areas and ravines; ranging from 450 to 2900 masl.

D. cedrosanum Trelease 1911 (Mexican Grass Tree). Found on the western slopes of the Sierra Madre Oriental and the Chihuahuan Desert, in association with xeric scrub and pinyon pine plant communities ranging from 850 to 3,000 masl.

D. miquihuanense Bogler 1994 (Arborescent Sotol). Present only in the *Altiplano Mexicano* (Mexican Plateau) of the Chihuahuan Desert in the south portion of the state and part of the southwestern portion of Tamaulipas, in association with xeric scrub and bordering zones of oak and pinyon pine forest ranging from 1600 to 2500 masl.

D. quadrangulatum Watson 1879 (Toothless Sotol). Found in the Chihuahuan Desert adjacent to mountain ranges in the western portion of Tamaulipas, in association with xeric scrub in riparian cliffs and forming ecotones with pinyon pine



Blue giant sotol, *Dasyilirion berlandieri*, in a rosetophilous scrub community, Sierra del Fraile-San Miguel, García, Nuevo León. Photograph by Ricardo Quirino-Olvera.

forests, ranging from 1680 to 2200 masl.

Nolina cespitifera Trelease 1911 (Robust Beargrass). Found on the western slopes of the Sierra Madre Oriental in association with xeric scrubs such as gypsophyllous and pinyon pine forests, ranging from 800 to 3000 masl.

Nolina hibernica Hochstätter and Donati 2010 (Green Beargrass Tree).

Found only in the foothills of the Sierra Madre Oriental in association with mixed coniferous, oak forests in Sierra San Antonio Peña Nevada, ranging from 1800 to 3400 masl.

Nolina nelsonii Rose 1906 (Blue Nolina). Found in the mountains of southern Tamaulipas, particularly in the municipalities of Miquihuana, Jaumave and Bustamante, which border the municipalities of Aramberri and Zaragoza in Nuevo León. It is found to the east and northeast of the municipalities forming ecotones with xeric scrub and pinyon pine, ranging from 1800 to 2550 masl.

Study Area

Nuevo León lies between longitudes W 98°17' and 101°07', and between latitudes N 23°06' and 27°50'. Neighboring states are Tamaulipas to the east, Texas to the northeast, Coahuila and Zacatecas to the northwest and west, and San Luis Potosí to the south and southwest. It forms an irregular rhombus with a sur-



Mexican grass tree, *Dasyilirion cedrosanum*, on a dry, rocky hillside on a large mountain, Cerro de la Popa, Mina, Nuevo León. Photograph by Ricardo Quirino-Olvera.



An association of arborescent sotol, *Dasyllirion miquihuanense*, on a hillside in La Cardona, Mier y Noriega, Nuevo León, the southernmost municipality in the state.



Robust beargrass, *Nolina cespitifera*, in association with agaves in a clearing of a pinyon pine community, an excellent refuge site, at “Cerro de la Calle” in the municipality of Santa Catarina, Nuevo León, within the Metropolitan Area of Monterrey.



Green beargrass tree, *Nolina hibernica*, in association with an agave community at “La Encantada,” municipality of Zaragoza, Nuevo León.

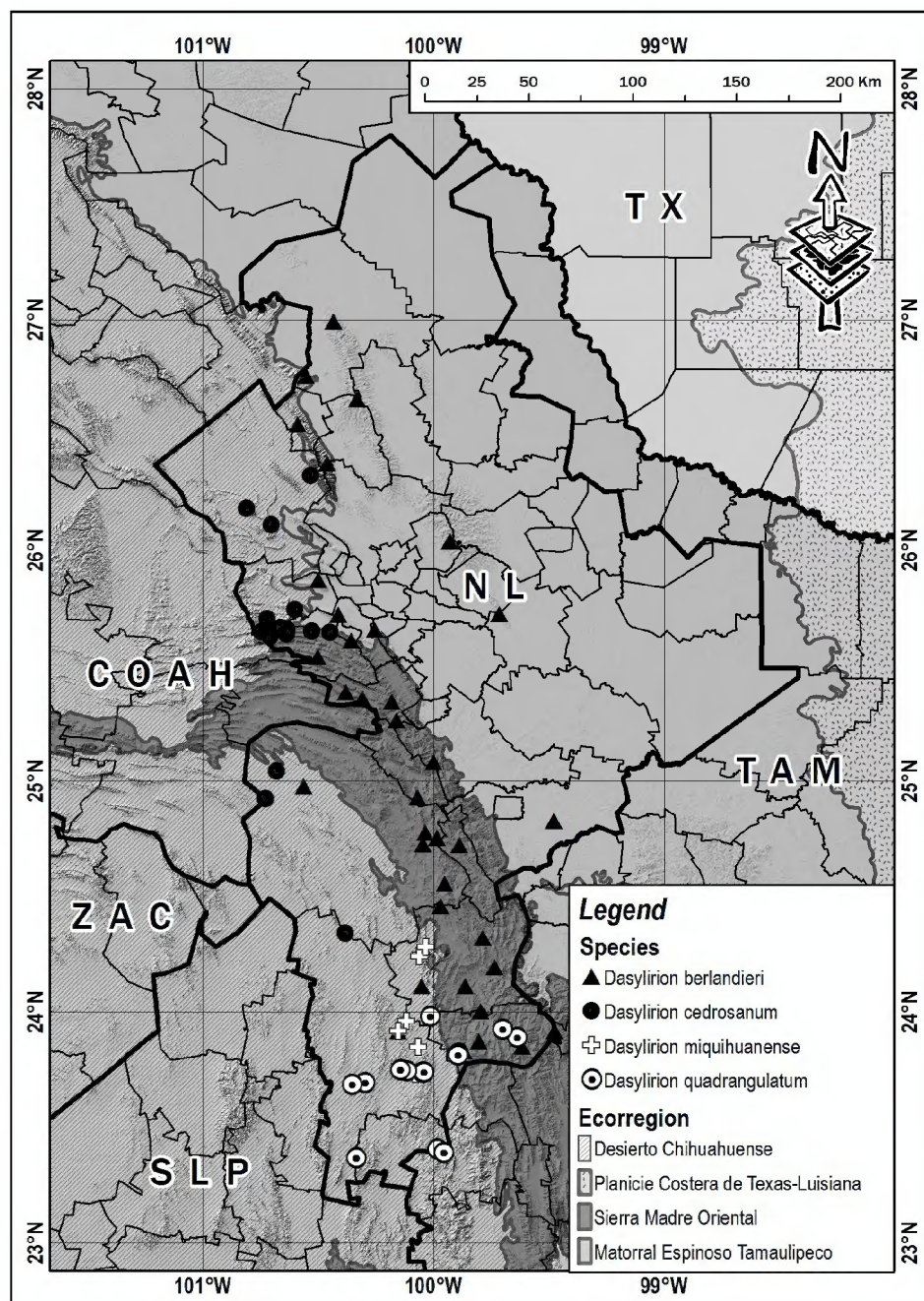


Toothless sotol, *Dasyllirion quadrangulatum*, in association with *Agave lechuguilla*, on a gypsum hill with a pinyon pine community near Santa Lucia, Doctor Arroyo, Nuevo León.

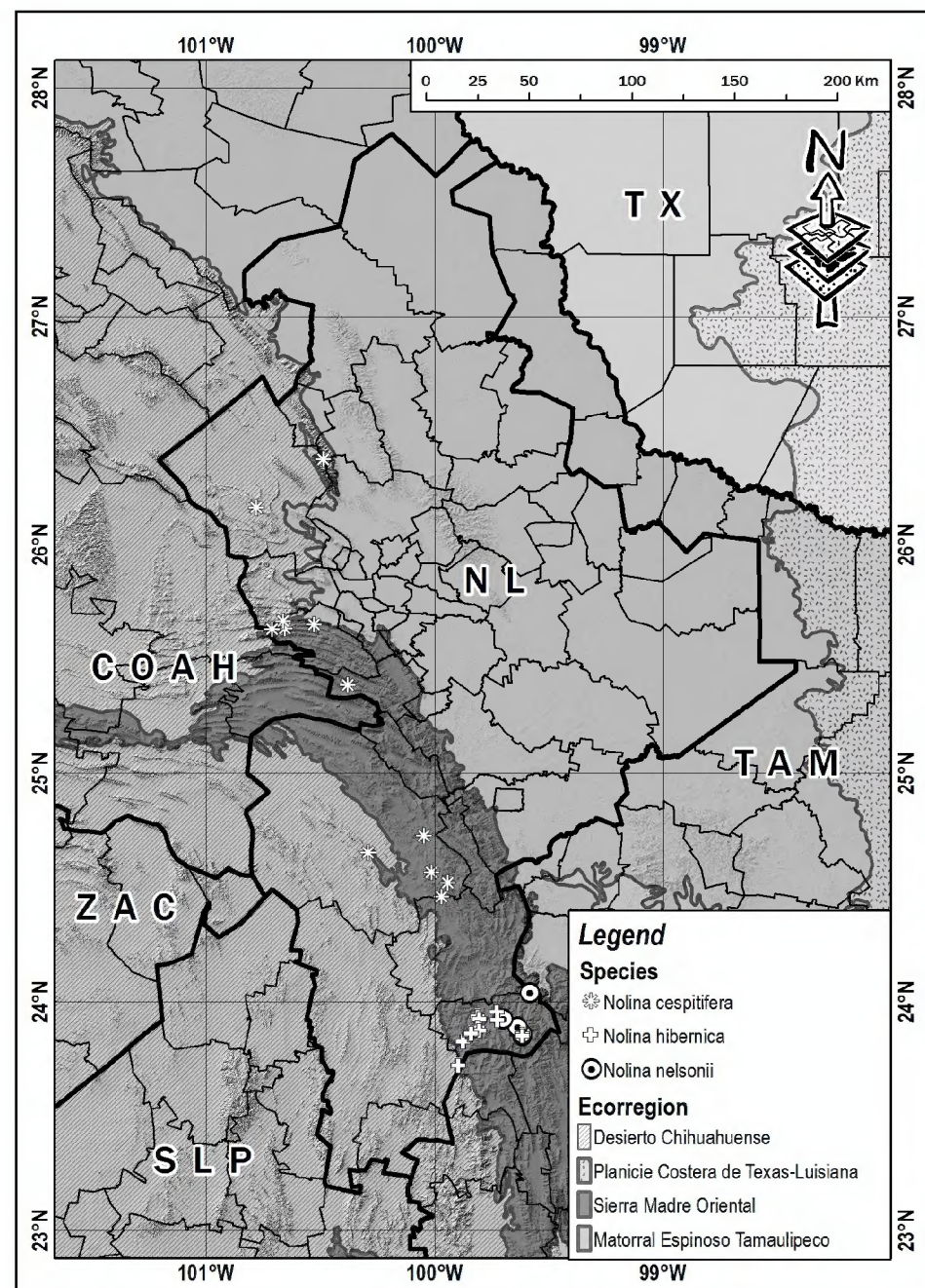


A large blue nolina, *Nolina nelsonii*, in association with a dense piedmont scrub community at “El Piñonal” in the municipality of Zaragoza, Nuevo León.

All photographs on this page by Ricardo Quirino-Olvera.



Map 1. *Dasyilirion* distribution in the state of Nuevo León.



Map 2. *Nolina* distribution in the state of Nuevo León.

face area of 64,081.94 km², and its maximum north/south axis exceeding 500 km. The majority of the state is found within the Northern Temperate Zone, and a small portion of its southern area lies south of the Tropic of Cancer (Cantú-Ayala et al., 2013). Maps 1 and 2 show the distribution of the species of sotols and beargrasses in the state of Nuevo León.

Nuevo León spans a transition zone between the Nearctic and Neotropical biogeographic divisions, giving the state a variety of ecosystems that have an enormous influence on distributional patterns of vertebrate groups (Cantú-Ayala et al., 2013). Within the state can be found some of the following vegetation types: gypsophyllous, piedmont, rosetophilous scrub, chaparral oak and pine–oak, forests (Cantú-Ayala et al., 2013).

The Sierra Madre Oriental is an extremely broken orographic formation running from north-northwest to south-southeast. It is an agglomeration of parallel mountain ranges with intermontane valleys. Elevations reach 2000–2500 masl in the southern portion of its extent within the state of Nuevo Leon, reaching an elevation of 3715 masl at Cerro “El Potosi” in Galeana and 3540 masl at Sierra San Antonio Peña Nevada in Zaragoza.

Vegetation and the Distribution of Herpetofauna

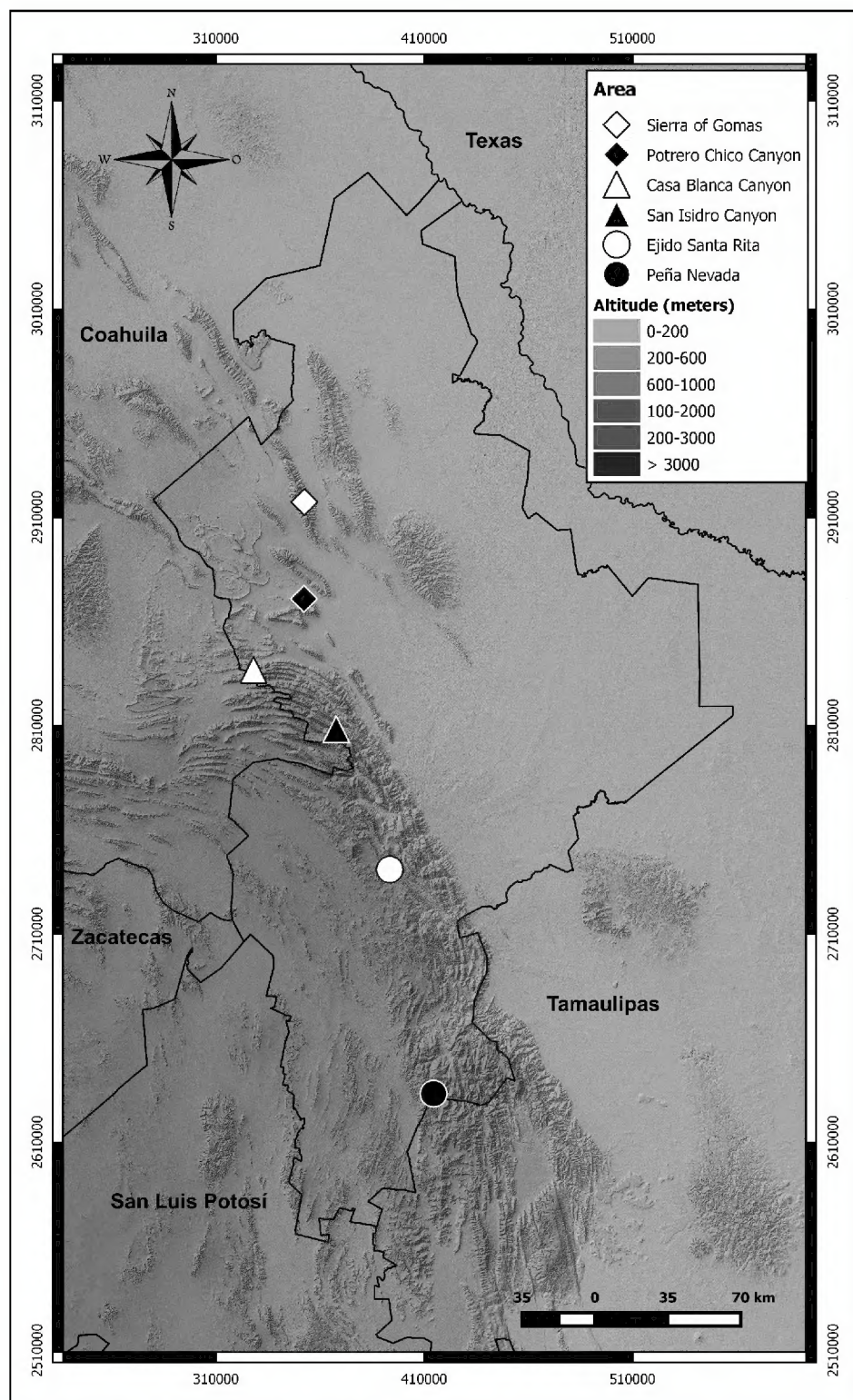
Vegetation communities play an extremely important role in determining the distribution of animal species. Vegetation provides elements of habitat which animal species require, such as microclimate, refuge and suitable areas for prey. The flora of Nuevo León is amazingly rich: our records show a total of 2903

species of vascular plants (Velazco-Macias, 2009). This botanical diversity plays an important role in the distribution of many invertebrate and vertebrate species.

Brief Descriptions of the Sites Visited in Nuevo León (Map 3):

1) Casa Blanca Canyon, Santa Catarina

This canyon is located to the left of the federal highway #57 Monterrey-Salttillo at km 41, in the municipality of Santa Catarina. Rosetophilous and piedmont scrub elements are present on the limestone walls at the entrance of this canyon. At the base of the canyon, we found the following plant species: *Cordia boisieri* (Texas olive / *anachueta*), *Gochnatia hypoleuca* (shrubby bullseye / *ocotillo*), *Chilopsis linearis* (desert willow / *sauce del desierto*), *Sophora secundiflora* (Texas mountain laurel / *colorín*), *Hechtia glomerata* (la guapilla), *Helietta parvifolia* (barreta / *barreta*), *Diospyros texana* (Texas persimmon / *chapote*), *Acacia berlandieri* (Berlandier’s acacia / *guajillo*), *Leucophyllum frutescens* (white sage / *cenizo*), *Pithecellobium pallens* (ape’s earring / *tenaza*), *Yucca filifera* (St. Peter’s palm / *palma pita*) and isolated individuals of *Juniperus deppeana* (checkerbark juniper / *táscate*). On the limestone walls of the canyon, we found *Brahea berlandieri* (rock palm / *palma de las rocas*) and several cacti: *Epithelantha unguispina* (button cactus / *biznaga blanca chilona*), *Mammillaria melanocentra* (pincushion cactus / *biznaga de centrales negras*), and *M. plumosa* (pincushion cactus / *biznaga plumosa*). Sotols and beargrasses included *Dasyilirion berlandieri*, *D. cedrosanum* and *Nolina cespitifera*, all forming ecotones. The



Map 3. Study sites in Nuevo León.

sotols are strongly associated with other rosetophilous scrub species. They are present throughout the altitude gradient, from 450 to 3200 masl. The canyon is located about 41 km west of the center of the Monterrey Metropolitan Area.

2) San Isidro Canyon, Santiago.

This canyon is located in that portion of the Sierra Madre Occidental known as the Curvature of Monterrey, within the Parque Nacional Cumbres de Monterrey in the municipality of Santiago. The canyon is located southwest of the municipality and is contiguous to the state of Coahuila. The canyon is approximately 2 km in length, at 1600 masl with limestone walls that are about 400 m in height. The vegetation along the stream is a gallery forest, with piedmont scrub and an oak forest community. On the canyon's rocky walls we found rosetophilous scrub, with xerophilous plant species. The canyon floor mainly contains piedmont scrub floristic elements such as: *Helietta parvifolia* (barreta / barreta), *Chilopsis linearis* (desert willow / sauce del desierto), *Cercis canadensis* (eastern redbud / árbol de Judas), *Gochnatia hypoleuca* (shrubby bullseye / ocotillo), *Acacia rigidula* (blackbrush acacia / chaparro prieto), *Acacia farnesiana* (sweet acacia / espinillo blanco), *Acacia berlandieri* (Berlandier's acacia / guajillo), *Sargentia greggii* (yellow chapote / chapote amarillo), *Arbutus xalapensis* (Texas madrone / madroño) and several oak species like *Quercus cambyi* and *Q.*

fusiformis. There is a gallery forest distinguished by *Platanus occidentalis* (American sycamore / alamo) throughout the canyon. At higher altitudes the vegetation goes from oak to pine forest with the following species: *Pinus pseudostrobus* (Monterrey pine / pino Monterrey), *P. teocote* (red pine / pino colorado) and *P. arizonica* (Arizona pine / pino blanco). Important sotols and beargrasses are *Dasyllirion berlandieri*, *D. cedrosanum* and *Nolina cespitifera*, forming ecotones with other plant communities. The sotols are strongly associated with piedmont scrub and agave communities. They are present throughout the altitude gradient which is from 450 to 3200 masl. The canyon is located about 41 km west of the center of the Monterrey Metropolitan Area.

3) Sierra of Bustamante Terrestrial Priority Region (Sierra de Gomas)

There are several different plant communities in this area. In the piedmont scrub plant community the dominant species are: *Acacia rigidula* (Blackbrush / chaparro prieto); *A. berlandieri* (Berlandier's acacia / guajillo), *Bernardia myricifolia* (mouse eyes / oreja de raton), *Eysenhardtia texana* (Texas kidneywood / vara dulce), *Forestiera angustifolia* (candlewood / ocotillo), *Helietta parvifolia* (barreta / barreta), *Leucophyllum frutescens* (Texas sage / cenizo), *Rhus pachyrrhachis* (wild currant / lantrisco) and *Schaefferia cuneifolia* (desert yaupon / granadillo). There is also an extensive area of xeric shrubland forest where we can observe: *Larrea tridentata* (creosote bush / gobernadora), *Pithecellobium pallens* (ape's earring / tenaza), *Acacia greggii* (catclaw / uña de gato), *Aloysia gratissima* (white-bush / cedro de monte), *Desmanthus virgatus* (wild tantan / huizachillo), *Zanthoxylum fagara* (wild lime / colima), *Cordia boissieri* (Mexican olive / anacahuíta), *Porlieria angustifolia* (Texas guaiacum / guayacan), *Celtis pallida* (desert hackberry / granjeno), *Castela erecta* (Texas goatbush / chaparro amargoso), *Condalia obovata* (logwood / brasil), *Condalia spathulata* (knifeleaf snakewood / hoja de navaja), *Prosopis glandulosa* (honey mesquite / chapote prieto) and *Yucca filifera* (St. Peter's palm / palma pita). There are also scarce patches of oak forest of different species of *Quercus*. Vegetation in the upper parts of the mountain range is pine forest with *Pinus pseudo-strobus* (Monterrey pine / pino Monterrey). The important sotol is *Dasyllirion berlandieri*, strongly associated with the piedmont scrub. These sotols are present throughout the altitude gradient, from 450 to 2900 masl. Sierra de Gomas is located 70 km north of the Monterrey Metropolitan Area.

4) Potrero Chico Canyon, Hidalgo

This canyon is near the town of Hidalgo, in the municipality of Hidalgo. Here we found elements of piedmont scrub vegetation such as *Cordia boissieri* (Texas olive / anacahuíta), *Gochnatia hypoleuca* (shrubby bullseye / ocotillo), *Chilopsis linearis* (desert willow / sauce del desierto), *Sophora secundiflora* (Texas mountain laurel / colorín), *Hechtia glomerata* (la guapilla), *Helietta parvifolia* (barreta / barreta), *Diospyros texana* (Texas persimmon / chapote), *Acacia berlandieri* (Berlandier's acacia / guajillo), *Leucophyllum frutescens* (white sage / cenizo), *Pithecellobium pallens* (ape's earring / tenaza), *Agave scabra* (rough agave / maguey bronco), and *Yucca filifera* (St. Peter's palm / palma pinta). On rocky limestone walls in the canyon, we found *Acacia berlandieri* (Berlandier's acacia /

guajillo), *Tecoma stans* (yellow bell / *tronadora*), *Helietta parvifolia* (barreta / *barreta*), *Brahea berlandieri* (rock palm / *palma de las rocas*), *Agave bracteosa* (squid agave), *A. lechuguilla* (Lechuguilla), and several globe-shaped cactus species: *Mammillaria melanocentra* (pincushion cactus / *biznaga de centrales negras*), *M. plumosa* (pincushion cactus / *biznaga plumosa*), *Ferocactus hamatacanthus* (barrel cactus / *biznaga costillona*) and several *Echinocereus* species (hedgehog cacti). The sotol species present in the area is *Dasyllirion berlandieri*, associated with piedmont and rosetophilous scrubs. This particular species is present throughout the altitude gradient which is from 630 to 700 masl. The canyon is located about 35 km northwest of the center of the Monterrey Metropolitan Area.

5) Ejido de Santa Rita, Galeana

In the flat portion of this *ejido* (a communal piece of land) the altitude is 1600 masl. There is a pine vegetation community (*Pinus* sp.) and between the pines we found patches of *Sophora secundiflora* (Texas mountain laurel), dispersed individuals of *Yucca filifera* (St. Peter's palm / *palma pita*), some herbaceous plants such as grasses, and globular cacti (*Coryphantha* sp., *Turbincarpus beguinii*, *Mammillaria* sp.). There are also some low hillsides with steep slopes, as well as the canyons formed by streams, where limestone and chalky soils are present. On these slopes we normally find piedmont scrub and rosetophilous scrub vegetation. The species present here include *Tecoma stans* (yellow bells / *tronadora*), *Hechtia* sp. (*la guapilla*), *Echinocactus platyacanthus* (giant barrel cactus / *biznaga burra*), *Ferocactus hamatacanthus* (barrel cactus / *biznaga costillona*) and other cacti (*Neolloydia* sp., *Turbincarpus* sp., *Thelocactus* sp.). Important sotols and beargrasses include *Dasyllirion berlandieri*, *D. cedrosanum* and *Nolina cespitifera*. These form ecotones with other plant communities. The sotols are strongly associated with a very disturbed area of pine-agave forest. They are present throughout the altitude gradient from 450 to 3200 masl. The site is located in the vicinity of the town of Galeana within the municipality of Galeana, about 100 km south of the Monterrey Metropolitan Area.

6) Sierra San Antonio Peña Nevada, Zaragoza

This area is in the southwestern portion of the state, part of the much larger mountainous area of the Sierra Madre Oriental, 30% of which lies within the municipality of Zaragoza in Nuevo León and 70% within the municipality of Miquihuana in Tamaulipas. This sierra encompasses 605 km²; its geographical coordinates are Latitude N 23°33'18" to 23°52'28" and Longitude W 99°38'55" to 99°56'45". Within the municipality of Zaragoza in Nuevo León, it occupies approximately 209.5 km² of sierras and canyons. It is now considered part of the National System of Priority Areas RTP-86 (Arriaga et al., 2000). We mainly visited a locality known as "La Siberia" and its surrounding areas. There is an altitude gradient from 2200 to 3450 masl, which favors the presence of different plant communities. There are extensive areas with *Arbutus xalapensis* (Texas madrone / *madroño*), *Pinus teocote* (Aztec pine / *ocote*), *P. hartwegii* (Hartweg's pine / *ocote blanco*), *P. arizonica* (Arizona pine / *pino blanco*). In the higher elevations the pine forests are associated with a beautiful fir forest of *Abies vejarii* (fir / *oyamel*). There are also extensive portions of *Quercus greggi* (Mexican oak / *encino Mexicano*).

In this mountainous site we can find the following major plant communities/forests: *oyamel* (fir), pine, oak, mixed forest and chaparral. Important sotol or beargrass communities are inhabited by *Dasyllirion berlandieri*, *D. miquihuense*, *D. quadrangulatum* and *Nolina cespitifera*. These species tend to form ecotones, combining with rosetophilous scrub elements, like *Yucca filifera* or *Y. carnerosana*. Here sotols are associated with various types of forest, like pine, oak and chaparral, and in many occasions with agaves in between the different forest canopies. They are present throughout the altitude gradient from 450 to 3000 masl. This complex sierra is located about 217.37 km southeast of the center of the Monterrey Metropolitan Area.

Materials and Methods

The study sites were sampled at different times from 1996 through to the present: 1) Casa Blanca Canyon: This site has received frequent visits since 2012. 2) San Isidro Canyon: We have been working this site since 2002. 3) Sierra de Gomas: We have studied this site since 2013; it is part of a research program for this protected area. 4) Potrero Chico Canyon. This site received our attention in 2000, 2002, 2008 and 2014. 5) Ejido Santa Rita, Galeana. This site received our attention in 1996–1997, and in 2002, 2006, 2009, and 2015. 6) Sierra San Antonio Peña Nevada: We studied and explored this site during 2002–2004.

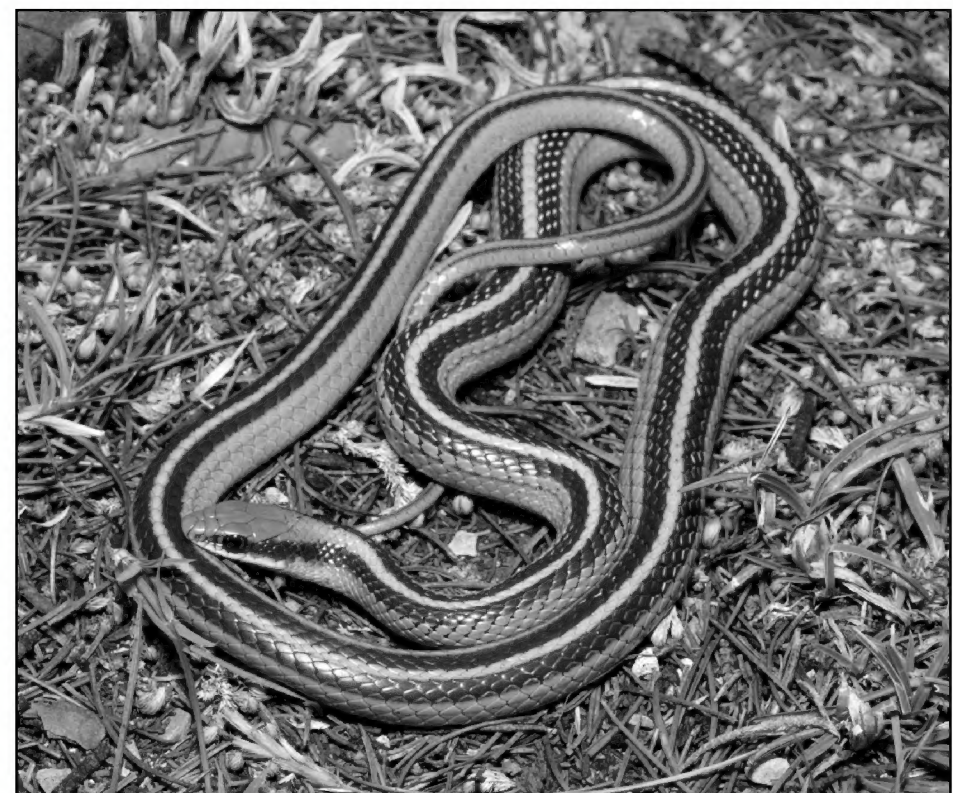
Results

The results presented here document the distribution of herpetological activity in or on sotol / beargrass species at the six study sites. Three categories of behavior were recognized, foraging, thermoregulation / basking and refuge, but the only behavior observed was refuge.

Species observed in each site:

1) Casa Blanca Canyon: *Aspidoscelis gularis gularis*, *Coleonyx brevis*, *Sceloporus couchii*, *Scincella silvicola caudaequinae* and *Salvadora grahamiae lineata*.

2) San Isidro Canyon: *Eleutherodactylus cystignathoides campi*,



Texas patch-nosed snake, *Salvadora grahamiae lineata*, a species often found in sotols. Photograph by Robert Hansen.



Horsetail Falls ground skink, *Scincella sylvicola caudaequinae*, an uncommon species found using sotols as a refuge. Photograph by Troy Hibbitts.



Plestiodon dicei, a species commonly found taking refuge in sotols. Photograph by Troy Hibbitts.

Gerrhonotus infernalis, *G. parvus*, *Sceloporus couchii*, *S. grammicus disparilis*, *S. parvus*, *Plestiodon dicei* and *Rhadinaea montana*. In the rainy season one particular sidebranch off the main canyon has abundant humidity and many ponds, permitting the growth and activity of many of the species mentioned above. On the walls of this side canyon we find aggregations of xeric scrubland such as sotols, which are used as refuge sites.

3) Sierra de Gomas: *Coleonyx brevis*, *Crotaphytus collaris* and *Sceloporus parvus* were seen using sotols as refuge.

4) Potrero Chico Canyon: *Sceloporus parvus*, *Plestiodon dicei*, *Coluber flagellum testaceus*, *Drymarchon melanurus erebennus*, *Rhinocheilus lecontei*, *Hypsiglena jani texana*, *Thamnophis proximus diabolicus* and *Crotalus atrox*.

5) Ejido Santa Rita: *Gerrhonotus parvus*, *Sceloporus grammicus disparilis*, *Plestiodon dicei* and *Salvadora grahamiae lineata*.

6).- Sierra San Antonio Peña Nevada: *Incilius nebulifer*, *Eleutherodactylus cystignathoides campi*, *Sceloporus grammicus disparilis*, *Sceloporus parvus*, *Plestiodon dicei* and *Storeria hidalgoensis*.

Discussion and Conclusion

The herpetofauna of Nuevo León comprises 139 species: 22 anurans, four salamanders, 106 squamates, and seven turtles (Lazcano-Villareal et al., 2010; Lemos-Espinal, 2015; Lemos-Espinal and Cruz, 2015; Lemos-Espinal et al., 2016; Nevárez de los Reyes et al., 2016). Here we document the activity of 21

species of herpetofauna using sotols as a refuge, representing 15.1% of the species diagnosed for Nuevo León (see Table 1).

Information on the use of specific species of sotols or bear-grass by the herpetofauna has not been documented, most articles mention the herpetofauna activity in plant communities that form ecotones with these rosetophilous species.

We suspect that many other herpetofauna species not on our list are using sotols that form associations mainly with agaves, chaparral or pine-oak forest. No foraging or thermoregulation/basking activity was observed in any of the sites. This is because of our limited time of observation.

In comparison with agave communities that were found to harbor approximately 23 species (Lazcano et al., 2015), here sotol communities were found to harbor 21 species. Agave communities seem to form widespread aggregations and come in contact with other plant communities such as chaparral, pine-oak forests; sotols form ecotones, but are not as concentrated as agaves. In some cases they are scattered in between other plant communities, reducing the possibility of finding resident herps. Perhaps this helps the herpetofauna that take refuge in the sotols to reduce predation.

Many of these sotol communities result from the destruction or succession of the primary plant communities. They are extremely resistant to fires (White, 1969; Thomas, 1991; Thomas and Goodson, 1992), so once they colonize the area they will be present there for decades protecting the surface soil and serving as refuge for resident or migrant species. This we document here for the herpetofauna. Our observations here document only two amphibian species; the loss of suitable habitat has been implicated in the decline of many amphibian populations (Alford and Richards, 1999; Stuart et al., 2004). We have noticed that as floristic richness increase, so does the herpetofauna. In our studies in Nuevo León, natural grasslands seem very low in herpetofaunal richness, but as plant succession occurs the herpetofauna moves in. This is happening in Sierra San Antonio Peña Nevada in Zaragoza (Lazcano et al., 2004), which has received intensive fires through all altitudes, especially on the tops of the mountain ranges where strong winds predominate.

Villaseñor (2016) documented the biodiversity of vascular plants in Mexico as 23314 species, distributed in 2854 genera, 297 families, and 73 orders. This biodiversity and the altitude gradients present in the country help to explain the high diver-



Blue-bellied lizard, *Sceloporus parvus*, taking refuge on a sotol in Sierra de Gomas, Nuevo León. Photograph by Manuel Nevárez de los Reyes.

Table 1. Species observed taking refuge in sotols and beargrasses at five localities throughout Nuevo León. **Status** = protection status under NOM-ECOL-059-2010 (SEMARNAT, 2010): Pr = Protección Especial (Special Protection); A = Amenazada (Threatened). **Locality**: 1 = Casa Blanca Canyon; 2 = San Isidro Canyon; 3 = Sierra de Gomas; 4 = Potrero Chico Canyon; 5 = Ejido Santa Rita; 6 = Sierra San Antonio Peña Nevada.

	Scientific Name	Common Name	Status	Locality
Amphibia: Anura				
Bufonidae				
	<i>Incilius nebulifer</i> (Girard, 1854)	Coastal Plain Toad	—	6
Eleutherodactylidae				
	<i>Eleutherodactylus cystignathoides campi</i> (Cope, 1877 [1878])	Spotted Chirping Frog	—	2,6
Reptilia: Squamata				
Lacertilia				
Anguidae				
	<i>Gerrhonotus infernalis</i> Baird, 1859 (1858)	Texas Alligator Lizard	Pr	2
	<i>Gerrhonotus parvus</i> (Knight & Scudday, 1985)	Pigmy Alligator Lizard	—	2,5
Eublepharidae				
	<i>Coleonyx brevis</i> Stejneger, 1893	Texas Banded Gecko	—	1,3
Crotaphytidae				
	<i>Crotaphytus collaris</i> (Say, 1823)	Collared Lizard	Pr	3
Phrynosomatidae				
	<i>Sceloporus couchii</i> Baird, 1859 (1858)	Couch's Spiny Lizard	—	1,2
	<i>Sceloporus grammicus disparilis</i> Stejneger, 1916	Northeastern Graphic Lizard	Pr	2,5,6
	<i>Sceloporus parvus</i> Smith, 1934	Northern Blue-bellied Lizard	—	2,3,4,6
Scincidae				
	<i>Plestiodon dicei</i> (Ruthven & Gaige, 1933)		—	2,4,5
Sphenomorphidae				
	<i>Scincella silvicola caudaequinae</i> (Taylor, 1937)	Horsetail Falls Ground Skink	A	1
Teiidae				
	<i>Aspidoscelis gularis gularis</i> (Baird & Girard, 1852)	Texas Spotted Whiptail	—	1
Reptilia: Squamata				
Serpentes				
Colubridae				
	<i>Coluber flagellum testaceus</i> Say, 1823 in James, 1823	Coachwhip	A	4
	<i>Drymarchon melanurus erebennus</i> (Cope, 1860)	Texas Indigo Snake	—	4
	<i>Rhinocheilus lecontei lecontei</i> Baird & Girard, 1853	Long-nosed Snake	—	4
	<i>Salvadora grahamiae lineata</i> Schmidt, 1940	Texas Patch-nosed Snake	—	1,5
Dipsadidae				
	<i>Hypsiglena jani texana</i> Stejneger, 1893	Texas Nightsnake	Pr	4
	<i>Rhadinaea montana</i> Smith, 1944	Nuevo León Graceful Brown Snake	Pr	2
Natricidae				
	<i>Storeria hidalgoensis</i> Taylor, 1942	Mexican Yellow-bellied Brownsnake	—	6
	<i>Thamnophis proximus diabolicus</i> Rossman, 1963	Arid Land Ribbonsnake	A	4
Viperidae				
	<i>Crotalus atrox</i> Baird & Girard, 1853	Western Diamond-backed Rattlesnake	Pr	4

sity and endemism of herpetofauna in Mexico. There is much work ahead for Mexican and international scientists to promote conservation of species and land, before everything goes down the drain.

Reflection

In an important document that analyzes the status of *Dasyilirion cedrosanum* in the state of Coahuila, Encina-Domínguez et al. (2013) mention that the effects of harvesting of this species for commercial purposes are unknown. Undoubtedly, there is an urgent need to design management plans in order to minimize the impacts of human disturbance on this community, as well as to prevent a potential shrinkage of *Dasyilirion cedrosanum* range; ultimately, such action may be critical for the conservation of this species. In this regard, the use of micro-propagation techniques for this species is cause for some optimism, as it could increase regeneration rates (Villavicencio-Gutiérrez et al.,

2007). Also, we need to study the population dynamics in all associations where this species occurs in order to ensure the most adequate regulation for its potential commercial extraction. Considering the lack of protected areas in this region, the conservation of the *D. cedrosanum* rosettophilous scrub community, as well as of all the endemic and threatened taxa associated with this community remains in peril under current land use practices. In order to be successful, the size and status of these areas should acknowledge the compromise between the needs of development and those of conservation (Riemann and Ezcurra, 2005). Unquestionably this is also happening to the other species of sotols in the northeast of Mexico.

Acknowledgments

To all our team in the field and laboratory for working rigorously and enthusiastically. To the San Antonio and Los Angeles Zoos, Bioclon Laboratories S.A. de C.V., and Universidad

Literature Cited

- Alford, R. A., and S. J. Richards. 1999. Global amphibian declines: A problem in applied ecology. *Annual Review of Ecology and Systematics* 30:133-165.
- Bogler, J. D. 1994. Taxonomy and phylogeny of *Dasyilirion* (Nolinaceae). Doctoral dissertation, University of Texas in Austin.
- . 1998. Three new species of *Dasyilirion* (Nolinaceae) from Mexico and a clarification of the *D. longissimum* complex. *Brittonia* 50(1):71-86.
- Cantú-Ayala, C. M. Rovalo-Merino, J. Marmolejo-Monsiváis, S. Ortiz-Hernández and F. Serina-Garza, editors. 2013. Historia Natural del Parque Nacional Cumbres de Monterrey, México. Universidad Autónoma de Nuevo León, Comisión Nacional de Área Protejidas, Parque Nacional Cumbres, Pronatura, Consejo de Flora y Fauna Silvestre de Nuevo León.
- Castillo-Quiroz, D., and A. Cano-Pineda. 2005. Guía técnica para el establecimiento de plantaciones de cortadillo (*Nolina cespitifera* Trel.) para la producción de fibras duras en el estado de Coahuila. México, D.F.: INIFAP (Instituto Nacional de Investigaciones Forestales, Agrícolas, y Pecuarias), Centro de investigación Regional del Noreste, Campo Experimental Saltillo. Folleto Técnico 16.
- Delfín, M. G. 2005. Breves noticias sobre la comida y la bebida entre apaches y otros pueblos indios del norte de México. Grupo Gastronautas. Historiadores de la cocina. [<http://www.historiacocina.com/paises/articulos/apaches.htm>]
- Encina-Domínguez, J. A., J. A. Meave and A. Zárate-Lupercio. 2013. Structure and woody species diversity of the *Dasyilirion cedrosanum* (Nolinaceae) rosette scrub of central and southern Coahuila State, Mexico. *Botanical Sciences* 91(3):335-347.
- Espejo, A. 2012. El endemismo en las Liliopsida Mexicanas. *Acta Botánica Mexicana* 100:195-217.
- García-Mendoza, A., E. Solano and M. Rivera-Lugo. 2012. *Nolina excelsa* (Nolinaceae) una nueva especie del estado de Oaxaca, México. *Botanical Science* 90(1):21-25.
- Hochstätter, F. 2010. Il Genere / The genus *Nolina* (Nolinaceae). *Piante Grasse* (1, supplement:1-48). [In Italian and English]
- Lazcano, D., A. Contreras-Balderas, J. I. González-Rojas, G. Castañeda, C. García de la Peña and C. Solís-Rojas. 2004. Notes on herpetofauna 6: Herpetofauna of Sierra San Antonio Peña Nevada, Zaragoza, Nuevo León, Mexico: Preliminary list. *Bulletin of the Chicago Herpetological Society* 39(10):181-187.
- Lazcano, D., S. Pacheco-Treviño, M. Nevárez de los Reyes, J. Banda-Leal and C. Barriga-Vallejo. 2015. Notes on Mexican herpetofauna 25: Associations of herpetofauna with agaves in the states of Nuevo León and Tamaulipas, Mexico. *Bulletin of the Chicago Herpetological Society* 50(6):77-86.
- Lazcano-Villarreal, D., J. Banda-Leal and R. D. Jacobo-Galván. 2010. Serpientes de Nuevo León. Monterrey, Mexico: Universidad Autónoma de Nuevo León.
- Lemos-Espinal, J. A. (editor). 2015. Amphibians and reptiles of the US–Mexico border states / Anfíbios y reptiles de los estados de la frontera México–Estados Unidos. College Station: Texas A&M University Press.
- Lemos-Espinal, J. A., and A. Cruz. 2015. Herpetofauna of Nuevo León. Pp. 83-100. *In*: J. A. Lemos-Espinal, editor, Amphibians and reptiles of the US–Mexico Border States / Anfíbios y Reptiles de los Estados de la Frontera México–Estados Unidos. College Station: Texas A&M University Press.
- Lemos-Espinal, J. A., G. R. Smith and A. Cruz. 2016. Amphibians and reptiles of the state of Nuevo León, Mexico. *ZooKeys* 594:123-141.
- Nevárez-de los Reyes, M., D. Lazcano, E. García-Padilla, V. Mata-Silva, J. D. Johnson and L. David Wilson. 2016. The herpetofauna of Nuevo León, Mexico: Composition, distribution, and conservation. *Mesoamerican Herpetology* 3(3):558-638.
- Quirino-Olvera, R. 2015. Nolinaceae en Nuevo León. Ponencia de la reunión ordinaria de la Sociedad de Cactáceas y suculentas del Estado de Nuevo León, 13 de Octubre 2015, Laboratorio de Botánica de la FCB, UANL, C.U. San Nicolás de los Garza Nuevo León.
- Riemann, H., and E. Ezcurra. 2005. Plant endemism and natural protected areas in the peninsula of Baja California, Mexico. *Biological Conservation* 122(1):141-150.
- Rivera-Lugo, M., and E. Solana. 2013. Flora del Valle de Tehuacán-Cuicatlán. Fascículo 99: Nolinaceae Takai. Universidad Nacional Autónoma de México. Instituto de Biología. Departamento de Botánica.
- Rojas-Piña, V., M. E. Olson, L. O. Alvarado-Cárdenas and L. E. Eguiarte. 2014. Molecular phylogenetics and morphology of *Beaucarnea* (Ruscaceae) as distinct from *Nolina*, and the submersion of *Calibanus* into *Beaucarnea*. *Taxon* 63(6):1193-1211.

- SEMARNAT (Secretaría del Medio Ambiente y Recursos Naturales). 2010. Norma Oficial Mexicana NOM-059-SEMARNAT-2010, protección ambiental — Especies nativas de México de flora y fauna silvestre — Categorías de riesgo y especificaciones para su inclusión, exclusión o cambio — Lista de especies en riesgo. México, D.F.: Diario Oficial de la Federación.
- Sierra-Tristán, J. S., C. R. Lara-Macías, R. Carrillo-Romo, A. Mendoza-Castillo, C. Morales-Nieto and M. H. Royo-Márquez. 2008. Los Sotoles (*Dasyllirion* spp.) de Chihuahua. México, D.F.: INIFAP (Instituto Nacional de Investigaciones Forestales, Agrícolas, y Pecuarias), Centro de Investigación Regional Norte Centro, Sitio Experimental La Campana-Madera. Folleto Técnico 20.
- Stuart, S. N., J. S. Chanson, N. A. Cox, B. E. Young, A. S. L. Rodrigues, D. L. Fischman and R. W. Waller. 2004. Status and trends of amphibian declines and extinctions worldwide. *Science* 306(5702):1783-1786.
- Thomas, P. A. 1991. Response of succulents to fire: A review. *International Journal of Wildland Fire* 1(1):11-22.
- Thomas, P. A., and P. Goodson. 1992. Conservation of succulents in desert grasslands managed by fire. *Biological Conservation* 60(2): 91-100.
- Trelease, W. 1911. The desert group Nolineae. *Proceedings of the American Philosophical Society* 50(200):404-443.
- Treviño-Carreón, J., J. Gutiérrez-Lozano, V. Vargas-Tristán, M de J. Aguirre-Bortoni and J. Fernández-Villarreal. 2012. La vegetación del altiplano de Tamaulipas, México. Pp. 1-11. *In*: E. Ruíz-Cancino and J. M. Coronado-Blanco, coordinadores, Recursos Naturales. Victoria, Tamaulipas, Mexico: Universidad Autónoma de Tamaulipas.
- Villaseñor, J. L. 2016. Checklist of native vascular plants of Mexico. *Revista Mexicana de Biodiversidad* 87(3):559-902.
- Villavicencio-Gutiérrez, E., P. A. Cano-Pineda and A. Juárez-Santana. 2007. Guía para la micropropagación y producción in vitro de plantas de sotol (*Dasyllirion cedrosanum* Trel.). México, D.F.: INIFAP (Instituto Nacional de Investigaciones Forestales Agrícolas y Pecuarias), Centro de investigación Regional del Noreste, Campo Experimental Saltillo. Folleto Técnico 37.
- White, L. D. 1969. Effects of a wildfire on several desert grassland shrub species. *Journal of Range Management* 22(4):284-285.

Book Review: *Amphibians of Costa Rica: A Field Guide* by Twan Leenders
Ithaca: A Zona Tropical Publication, Comstock Publishing Associates (Cornell University Press)
2016. ix + 531 pp. Softcover. US\$35.00. ISBN 978-1-5017-0062-0.

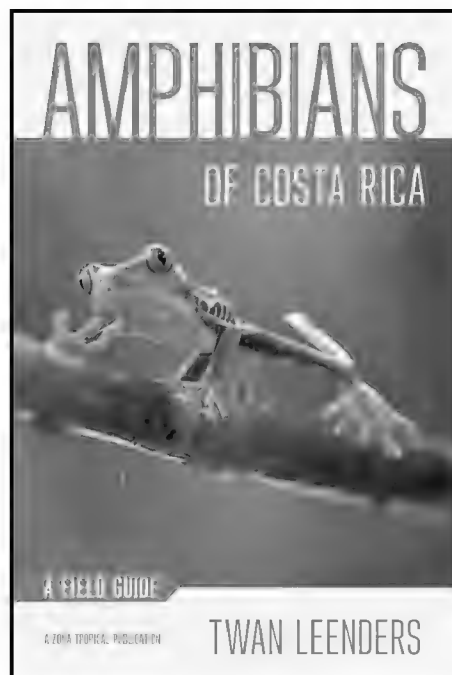
Martha L. Crump
Department of Biology
Utah State University
Logan, UT 84322-5305
marty.crump@usu.edu

This and many other books and products are available at Amazon.com. If you go to <http://smile.amazon.com> and designate the Chicago Herpetological Society as the charity you wish to benefit, then any purchases you make will help to support the CHS.

How I wish I'd had Twan Leenders' *Amphibians of Costa Rica* during the 1970s and 1980s when I studied granular poison dart frogs, meadow treefrogs, variable harlequin frogs, golden toads, and Mexican burrowing toads in Costa Rica. This is *the* Costa Rica amphibian field guide for which professionals and amateurs have been waiting. Comprehensive, clearly written, illustrated with beautiful photographs throughout, and chock-full of fascinating natural history information, the book is the result of Leenders' nearly 25 years of studying the amphibians of Costa Rica. After reading the book, I promised myself to return to Costa Rica as an amphibian ecotourist — not to collect data this time, but to observe and enjoy the wonder of the country's diverse amphibian fauna.

The guide begins with a dedication that sets the tone for the book: "For those with a curious mind, a love of nature, and a desire to learn: share that passion widely so that future generations will be able to enjoy the stars of this book!" As Leenders writes, "The book is first and foremost a field guide, meant to help readers identify the country's frogs and toads, salamanders, and caecilians—and to give them information about the natural history of these fascinating animals." It is also an introduction to the diversity of the country's 147 species of frogs, 53 species of plethodontid salamanders, and seven species of caecilians.

A short introduction includes description of the geography, climate, and weather of Costa Rica; brief description of the country's five ecoregions, including a color-coded map and photographs of each region; a cogent discussion of classification and scientific names; a section on observing and identifying amphibians; a brief discussion of declining amphibian populations; and a plea for readers to be citizen scientists and share their observations with other naturalists, researchers, and conservationists. Leenders writes: "This book will hopefully help increase communication between observers, researchers, and conservationists by providing citizen scientists with the information they need to identify amphibian species in Costa Rica and to learn their conservation status." Information can be shared with local researchers, reserve managers, park rangers, and with Leenders himself at anfibiosCR@rtpi.org. Readers will be amazed at the number of endemic species that are known from single specimens and those that have extremely limited distributions. Clearly, there is much to learn still about the distribution of Costa Rica's amphibians. Thus the plea for observations of



correctly-identified species by citizen scientists.

The book is divided into three sections: Order Gymnophiona (caecilians), Order Caudata (salamanders), and Order Anura (frogs and toads). Each account of the country's 207 species of amphibians consists of a distribution map, conservation status, relevant natural history information (superbly condensed from the scientific literature), description (including beautiful photographs, diagrams, and relevant field marks to help with identification), and photographs and brief descriptions of similar species. Throughout there are excellent discussions of taxonomic issues—never dry, but always informative. The writing is clear, concise, and engaging.

Amphibians of Costa Rica ends with a useful glossary that provides clear definitions for words that might be unfamiliar to some readers. A bibliography includes some of the relevant published research on Costa Rican amphibians, and, of course, suggests that a great place to learn more about the animals is Jay Savage's *The Amphibians and Reptiles of Costa Rica: A Herpetofauna Between Two Continents, Between Two Seas* (University of Chicago Press, 2002). Two blank pages are provided for "Notes," followed by a map of Costa Rica that includes cities, national parks, volcanoes, and rivers.

Twan Leenders' book is more than a field guide. It is a celebration of the diverse amphibian fauna of Costa Rica. By concisely summarizing fascinating aspects of the natural history of these animals and showing us the beauty of these caecilians, salamanders, and frogs in living color, Leenders has given us a treasure. He has encouraged us to pursue our curiosity, learn about this diverse fauna, share our passion, and protect amphibians so that the next generation can enjoy the animals.

Grab your flashlight, rubber boots, raincoat, and camera, and explore Costa Rica's Isthmian-Atlantic moist forests, Talamancan montane forests, Isthmian-Pacific moist forests, seasonal moist forests, and dry forests. We just might run into each other in one of these ecoregions, thumbing through our dog-eared and well-loved copies of *Amphibians of Costa Rica* by Twan Leenders. No traveler to Costa Rica interested in amphibians should be without this book. For the armchair traveler, the book provides a photographic feast for the eyes and a virtual tour of the diverse natural history of Costa Rica's amphibians.

A Monstrous Halloween Treat

Roger A. Repp
National Optical Astronomy Observatory
repp@noao.edu

Written with reverence and gratitude to Mike Pfander of C & M Framing and Construction. He is a man of heart, and a man of action. Our world needs more people like him.

On the morning of 28 October 2016, all hell was breaking loose at National Optical Astronomy Observatory. To say it was a rather frantic Friday at my place of employment would be an understatement. A truck carrying 125 primary mirror actuator housings was about to arrive at our loading dock. I had barely 15 minutes notice to assemble a crew to assist with unloading this incoming truck. Just after I received the phone call from the truck driver, I was about to leave my office to gather my co-workers. And then, the phone rang again. I glanced at the number that came up on my high tech government spy phone. Upon noting that it was a number I didn't recognize, I left it for the message machine to handle. I sprang into action, seeking my absent coworkers—not a one of which was in my line of sight. A gang of three was found in a nearby building, busily assembling other components related to the primary mirror. The sight of them industriously threading a confusing snarl of pneumatic tubing into their proper fittings was so impressive that I pulled my camera from its side pouch and snapped some images. Having my camera with me this day was highly fortuitous—if not downright serendipitous. I normally don't carry my camera to work with me, but a monthly report on the progress of our activities was imminent. I have learned that while nobody on this particular project actually reads my reports, they *do* look at the pictures. (About six months ago, I buried an offer of 20 bucks to the first person to request it in the text of one of these reports. To date, that offer has gone unclaimed).

Following the work-related paparazzi, my crew was informed of the arriving shipment. I told them to meet me in the yard in ten minutes, and I'd be right out to help. I then headed back to my office to grab some gloves, and noticed the message light blinking on my phone. Why I retrieved that message at that point in time was another example of the pure aura of serendipity that surrounded me this day. When in the middle of something urgent, I normally will ignore phone messages until the task at hand is behind me. For whatever reason, I picked up the phone and punched in the necessary numbers to get to that message. What I heard when I listened to the recorded voice entirely changed the course of my day.

The caller was a gentleman by the name of Mike Pfander, who works for a company called C & M Framing and Construction. He was the lead man of a crew that was digging a foundation for an addition on a house. With the first couple swipes of the backhoe that morning, they had uncovered three baby Gila Monsters that were in the process of hatching out of their eggs. According to the message, which was very thorough, they were holding the three hatchlings in hopes that they would interest somebody. Would I please call him back?

Three baby Gila Monsters? In the process of hatching? If that was true, then Mr. Pfander had just discovered the answer to the

mystery that has eluded every Gila Monster Jedi to ever walk the planet. For the past 20 years, long term radio-telemetry studies got us close to solving this mystery. We would witness some of our females get fat in the spring. Ultrasound would reveal if these fat females were gravid, and if so, how many eggs they were carrying. From late June to early July, we'd see them enter their nest sites fat, and come out skinny a couple of weeks later. Hence, we would know when and where they had laid their eggs. While it was general knowledge that the hatchlings did not emerge from their nest sites until late April at earliest, it was the DeNardo lab that proved that by setting up drift flashing and bucket traps at the nest sites. The hatchlings started plopping into the buckets from May to August. This meant that the time span between the eggs being laid and the young leaving the nest could be ten months or longer. What we didn't know was when the eggs hatched. The lack of this basic knowledge was not because we didn't try. At various time intervals, we dug holes deep enough to bury a pickup truck, often finding not a shred of evidence in the process. Two conflicting notions as to the when of the hatching were in the minds of the experts. One cohort believed that they hatched roughly 130 days after being laid, while others believed that they overwintered in the egg, and hatched in the spring. In short, until 28 October 2016, *nobody* had ever documented uncovering a nest site at the right time to prove either scenario.

Getting back to where we were one lengthy paragraph ago, the reader can bet their bottom dollar that I was on that phone in a heartbeat, and Mike answered on the first ring. It had been quite the morning for him. As soon as he found the little monsters, he made an intensive effort to find somebody, *anybody*, interested enough to come out and investigate his find. His first phone call actually went to a guy whose response flabbergasts me to this very day. He is perhaps the most knowledgeable field herpetologist in all of Arizona. His response was "Everybody knows that Gila Monsters don't hatch until spring—so just bury them back close to where you found them, and all will be well." They don't hatch until the spring? Yegads! Bury them close to where you found them? Goodness gracious! Opportunity knocks, and he slams the door shut on it! Thankfully, Mike didn't listen to this lame advice, and continued his efforts to locate somebody who *was* interested. His phone searching led him to various institutions that certainly should have sent somebody, but it was apparently a good morning to urinate on history-making opportunities. Mike eventually called the Phoenix Herpetological Society, and got hold of Russ Johnson, who gave him my name and phone number. Thus it came to pass that after over two hours of phone effort, Mike found his man. But even that grew difficult, for our connection was bad, and the line kept going dead. Several phone calls later, he blurted out an address, and I promised that I'd be there in half an hour.

There next ensued a frantic assault on the sequences that were required to get me out the door. First, I typed the address Mike gave me into my favorite search engine, and printed out a map. I next pecked a hasty email to Dale DeNardo. The subject was: “Monster nest uncovered.” The text was: “3 young, still one in egg. I’m on it, I’ll be in touch when it is behind me.” I next found my team, and explained to them that the first ever wild Gila Monster nest had been discovered, and I had to leave immediately. They rolled their eyeballs at this announcement, knowing that this meant that I was deserting them in a crisis situation. But one of them turned me loose by saying “Bring them back—we want to see!” For the second *Bulletin* in a row, we emphasize that having understanding coworkers is paramount to a successful avocation in herpetology. Lastly, I grabbed a five-gallon bucket, a tape measure, a pad of paper and a pen, and was out the door.

The construction site was located in the foothills of the Catalina Mountains, on the north side of Tucson. The neighborhood could best be defined as semi-urban, in an upper middle class neighborhood, with roughly one house per acre tastefully situated in such fashion as to allow wildlife corridors throughout. The roads through the area are narrow, and twist and turn every which way in such fashion that the light traffic they receive is forced to travel slowly. The area purveys the serene feel of being away from it all, when in reality; the “it all” of Tucson is only a half-hour away. There are spectacular views of the massive bulk of the front range of the Catalina Mountains, less than a mile to the north. The proximity to the immense biomass of the Catalinas assures a steady stream of wildlife through the vicinity—especially herps. The people who live here are mostly ardent lovers of nature, who throw up bird feeders and keep their vegetation well-watered. This all serves to set up an oasis situation in a landscape that is already conducive to wildlife. There is no doubt that I could find more herps here than most places that I visit (see Figures 1 and 2).

I pulled into the driveway of the hallowed ranch house which doubled as the sanctuary for the holiest of all nest sites. The address on the mailbox, the backhoe, and the growing trench and subsequent pile of loose earth at the southeast corner of the dwelling all pointed to being in the right place. Mike Pfander

was there to greet me as I stepped out of my vehicle. He was exactly as I visualized him to be—a slender, wiry and leather-skinned individual of moderate height who carried an air of authority in his world. Yet inside that tough exterior was a heart of gold. The first few exchanges between us indicated that he had a thorough grounding in the natural world. His daughter was a wildlife biologist working for the state of Idaho, and his wife worked for the University of Arizona, maintaining close ties with the Bio Science Department in the process. His diligence in trying to locate somebody who would deal with the issue at hand might serve to demonstrate his good heart. His time is money, and the project he was involved with would have benefitted greatly if he had just quietly buried the evidence. (Or flushed them down the nearest toilet).

Speaking of evidence, Mike next led me to a shady patch of ground that contained a plastic gallon jug. The top 25% of said jug was neatly cut away, offering my first look at what was inside. So thrilled was I with the contents of that jug that I almost fainted, but shook it off. “Hot-diggity-damn,” I exclaimed. “By golly, Mike, you’ve done it!” Within the framework of the jug were three hatchling Gila Monsters (*Heloderma suspectum*). We knew they were hatchlings, mainly because all three were still connected to the egg by their umbilicus. One was still completely inside the egg, but the jagged and serrated edges of the half-moon opening traversing the shell revealed that this one was in the process of slicing through the egg from the inside. A second hatchling was hanging half out of its egg, and the third was lying at the bottom of the jug in a pile of matted blood and gravel. This one was completely out of the egg, yet still connected to it by soft tissue. My first thoughts were that the matted bloody tissue was just part of the umbilical cord. However, closer examination during processing of these hatchlings revealed that my lucky day now also became this little guy’s lucky day (but more on that later). My first look at the hatchlings was brief, as I was acutely aware that my presence was getting in the way of progress. Most likely as a safety precaution to assure the safety of the visitor (me), the backhoe was not digging. That alone is minimally a \$300 per hour proposition, and my connections to industry have taught me that “time is money” in affairs such as this.



Figure 1. The view from the north end of the house receiving the addition. “There are spectacular views of the massive bulk of the front range of the Catalina Mountains, less than a mile to the north.” Image by the author.



Figure 2. Looking west at the front yard of the house and property that the nest was located. Note the pile of earth to the left center of the image, at the southeast corner of the house. This is where the trenching was dug for the footing of the addition. Image by author.



Figure 3. A perfect Gila hole! This is the only possible way into the nest site. It is against the foundation of the house, on the north side of the trench. The first three hatchlings were found just beyond the framework of the photo, very close to the north wall of the trench, just prior to the author arriving. Image by author, taken 28 October 2016.

But through everything that followed, Mike was obliging, and his crew seemed more than willing to help me in every way possible. Bless them all—they done splendid. My first request was to be shown where these three monsters had been found. A trench that was roughly 1.2 meters deep, by 1.5 meters wide, extended outward from the southeast corner of the house. It traveled roughly ten meters in eastward fashion, stopping at the front caterpillar style steel treads of the now-idle backhoe. Mike led me westward down the trench bottom, stopping just short of the house to point out the location of the nest. The three monsters had been found against the north wall of the trench, at a tape-measured depth of 28 inches. Roughly 60 cm east of the place that Mike pointed, still on the north wall of the trench but against the foundation of the house itself, and slightly above the bottom of the trench, was the perfect Gila hole. It beckoned me like a geek magnet. It might be immodest of this author to state that this was the perfect Gila hole with the utmost in confidence and authority. But when one studies an animal that lives a large percentage of its life underground for over 20 years, including 13 years with thousands of high tech hits on radio-telemetered individuals, one *knows* what a Gila hole looks like.

As further example of the aura of pure serendipity that surrounded me this day, I also had my all powerful, lithium-charged, light emitting diode-infested field flashlight with me this day. It had been inadvertently left in my truck following a nocturnal field trip a couple nights previous. This allowed me to go deep with this perfect Gila hole. The results of the deep look: The tunnel went straight north (along the foundation) for 12" (tape measure), and then forked. The main fork continued northward, nearly ramrod straight and perpendicular to the trench, traveling along the foundation of the house. The other fork intersected this one in a nearly perpendicular fashion, moving eastward just outside the north wall of the trench. Both forks continued on beyond my ability to see. Both forks were also perfect Gila holes. There were no other holes on either side of the trench. This fact, coupled with the close proximity to where the three hatchlings had been collected, allow me to state with a high degree of confidence that this was the hole that mamma monster used to get to her nesting site (Figure 3).

Just after photographing the hole, a chance glance at the earth pile to the north of the trench sent my eyes out on stems. A gaudily colored orange and black lizard, roughly 15 cm long, was viewed wiggling out of the top of pile. It took one look at me, and started barreling away at top speed. This day was getting better by the minute! As fast I was at getting to it, Mike was faster. He already had a forked stick in hand, deftly flicked that little monster onto it, and neatly slipped it like a snippy little hot potato into the water jug that contained the three other hatchlings. Damn, my camera was ready (I had just photographed the nest hole), but the capture was too fast for me to photograph. Within seconds of this happening, I noticed an egg fragment above a little depression next to where Mike snagged that little monster. I was about to reach down to grab this, when I observed a mini-landslide starting to trickle down from the upper rim of the depression opposite the fragment. The cascading bits of soil intensified, and a tiny black snout thrust its way into view. Then, the snout started to inch forward, causing little trickles of loose earth to spill down off either side of the head. I suggested to Mike that "I got this one." He saw me taking my photos, and did the same. During the photographic process, the little monster stayed put (Figure 4). After taking several images, I pounced on it, snagged it behind the head, and dropped it into the hallowed jug. We now had five hatchlings, would there be more? I floundered about the area, digging with my hands in several places. I uncovered another egg shell, but that was to be the only result of my digging effort. Once this productive inter-



Figure 4. 28 October 2016, at 1017 hours. Just after taking the image shown in Figure 3, the author noticed a baby Gila Monster wiggle out of the pile of dirt removed from the trench. Before I could react, Mike Pfander captured that one. Moments later, this baby Gila Monster was seen starting to emerge from the same dirt pile. And what's the first sight this poor thing sees as it enters an otherwise big and beautiful world? Roger Repp's face beaming downward upon it! Note that there is also an empty egg casing in the foreground. Image by the author.



Figure 5. Mike Pfander showing where the first hatchlings were found. The numbering system for the hatchlings was established during the processing, which occurred on 30 October. Hence, the first three hatchlings that were found during the dig are now numbers 1, 4 and 5. Also shown, the location of the two hatchlings found emerging from the trench tailings while the author was present. These were later numbered 2 and 3. Note also the water jug, which at the time this photo was taken, held five baby Gila Monsters. Image by author.

ruption was behind us, I took some images of Mike and his coworker pointing out where the first three hatchlings were uncovered (Figure 5). I did a quick photographic survey of the area surrounding the dig. The most likely above ground entrance to the nest had been stripped clean of vegetation, and had a 1.5 meter tall pile of dirt covering most of it. A front porch, resplendent with perfect masonry and no doubt a quality, deep running foundation juts eastward from the house, to the north of the trench. Somewhere between the porch and the trench, mamma likely entered the nest site, and eventually deposited her eggs. At my request, Mike later sent me an image of the house taken on 8 October 2016, before the work began. An island of vegetation can be viewed clustered against the side of the house, roughly 5 meters north of where the trench was created 20 days later. Said vegetation consisted of a mesquite and paloverde tree, blanketed by a thick patch of prickly pear cactus and a young saguaro. Mike informs me that the area was riddled with holes, which he identified as a ground squirrel nest. While it is highly speculative to even consider, I suspect that this might be the place where mamma entered the nest hole, probably around mid June



Figure 7. A stick midden of a pack rat was in the vicinity of the dig, as were many clumps of vegetation riddled with small rodent holes. The area around the house suggests a diverse and healthy rodent population. Image by the author.



Figure 6. This is the only image in our possession of the house prior to the work on the addition starting. While it is highly speculative to do so, the author has placed an X above the island of vegetation that, in his estimation, was the most likely area the mother Gila Monster could have utilized when entering the nest site—probably around mid-June of 2016. According to Mike Pfander, the area was riddled with small rodent holes, which he identified as a ground squirrel nest. Image taken 8 October 2016. Photograph courtesy of Mike Pfander.

of 2015 (Figure 6). Further photos ensued in the area to the south of the dig. The vegetation there was pock-marked with soil holes, and the telltale stick mound of a pack rat suggested that the area contained the type of biological soup that attracts such animals as Gila Monsters (Figure 7).

Mike and I next exchanged business cards. In order to assure him that my visit and what was to follow was entirely legal, I showed him DeNardo's permit with Arizona Game and Fish. I am an agent on this permit, as on occasion I provide Dale with either blood or a carcass for his ongoing Gila Monster spatial analysis study. Mike promised to send me some images that he took prior to my arrival, and I promised to keep him abreast of developments. The last detail to remain was for me to get some of the nest dirt. This was done with full knowledge of the importance of making the young ones feel at home for whatever was to follow. We filled my bucket roughly 40% up with the earth that had surrounded the two monsters that were collected when I was at the scene. With that, I took my leave.



Figure 8. This image is one of only two in our possession that shows one of the hatchlings in situ on the trench bottom. It was this hatchling that tipped off the crew that they had discovered a Gila Monster nest. This image is also the first hatchling that we processed. Look for number 1 in further images that accompany this article. Photograph by Mike Pfander, 28 October 2016, at 0656 hours.



Figure 9. All five hatchlings in the plastic gallon water jug provided by Mike. They are numbered according to the order that they were processed. Image by Ron Harris.

By the following Monday, I had received enough information from Mike to piece together most of what transpired this morning. One image that he sent was of one of the monsters still in the trench (Figure 8). The time the image was taken was 0656 hours. Mike next began the phone calls described earlier. I called Mike back for the first time at 0920. I arrived at the scene at 1009 hours. At 1012, the first monster wiggled out of the dirt pile, and 1017, the second was photographed in situ. The total time that elapsed from the nest being discovered and the fifth hatchling being in my possession was roughly 3.5 hours.

I arrived back at work just in time to see the last box being unloaded from the truck. In other words, my timing was immaculate. I *did* sign for the items, which was the very least that I could do. My coworkers took turns admiring the five little monsters in the jug, and an excused absence was bestowed on me. As my stalwart coworker Ron Harris has the steadier hand, I loaned him my camera, and he took the first few images of the five siblings together (Figure 9). I checked my email, to see that Dr. DeNardo had responded within two minutes of my email to him. Said response was: “Definitely keep me posted. It’s an odd time of year UNLESS they do indeed hatch out in the captive norm of ~130 days and just stay in the burrow system sometime until May–July. Pictures as much as possible as well as how the hell someone came across this.” Meanwhile, the word got out that Repp had some baby Gila Monsters in his office, and an onslaught of visitors began to materialize, armed with cameras and lots of questions. It quickly became apparent that I needed to get those monsters out of there, lest somebody get bit. I left a message on Dale’s cell phone, telling him I was going home, where the only way to reach me was by my home phone. While heading for the door, I met several people who were all armed with cameras and questions. I thought I’d never get away! But it was refreshing and noteworthy that so many people were enthused about it all. Upon arriving home, there was a handwritten message from my wife Dianna. Said message was “Call Dale.”

There was nobody in the world who I wanted to speak with more than Dale. While the phone was utilized for the discussion that followed, this author was so stoked that he could have shouted in the general direction of Tempe and been heard. Dale had not been letting any grass grow under his feet from his end.



Figure 10. Nothing conveys the message “I hate you” better than a gaping Gila Monster of any size. As this image of number 2 demonstrates, though barely out of the egg, these hatchlings are far from defenseless. Image by Ron Harris.

He had already cleared my actions with Tom Jones, who is the state herpetologist for Arizona Game and Fish. Tom was of course on board with me rescuing the little gems, but wanted them delivered to Dale for safekeeping. Dale seemed hesitant to tell me this--like perhaps I might want to keep them? Truth be told, I was trying to figure out a way to ask Dale if he was willing to take them. He carries a double doctorate, one in Biology, and the other as a DVM. He has an entire biological laboratory at his disposal, centered in the Life Sciences Building of Arizona State University. By delivering the hatchlings to Dale, they would be in the best possible hands. We agreed that I would bring the brood Dale’s house Sunday morning, where we would thoroughly examine and process them. I was not to give them food or water, as that would obviously jeopardize the important metrics that were to follow. In other words, doing nothing further with them was the best plan moving forward. As doing nothing is what this author does best, there was no problem obeying such an edict.

Shortly after my phone call with Dale, Dianna called me. Dale had informed her of the package that I was bringing home, and she was excited to hear more. Upon my relaying some details, she wanted to come home and see for herself. She arrived roughly a half-hour later, and was an absolute bastion of enthusiasm about it all. She used her iPhone to take some video of the little gems. Said video has already proven priceless, and might someday be more important than we could ever guess. The video clearly reveals that while the little goggers were less than a few hours out of the nest, they were highly alert and active in their little jug. While we were no longer dealing with a wild nesting situation, the images and video that we took plainly reveals that while in the process of hatching, they are completely ready to face their new world. While the reasons they remain underground for so long before emerging from their nest sites remain unclear, being helpless is most assuredly not one of them (Figure 10).

Through the years, Dianna has proven to be extremely adept in assisting me with processing any wild thing that I bring home. This fact, coupled with her unbridled enthusiasm about this particular event, made it a no brainer to invite her to help Dale and me with the processing. She was more than pleased at the offer, and accepted. Every herper ought to have a spouse like



Figure 11. Upon getting the little Gila Monsters home, their plastic water jug was placed in a five-gallon pail, partially filled with nest soil. On the morning of 30 October these two, # 1 (still attached to the egg by its umbilicus), and #2 had climbed out of the jug. Image by the author.

Dianna! Following the video session, the jug containing the five hatchlings was placed in the bucket of nest dirt, and capped with tight-fitting lid. Other than occasionally prying the lid up to peer inside, they were left in this situation until Sunday morning, 30 October, arrived. During the first overnigher, the first monster collected from the earth pile worked his way out of the jug, and was viewed wandering in circular fashion around the inner perimeter of the bucket. Just before retiring for bed for the second evening, I put it back in with its siblings. The following morning, this one had once again plopped out of the jug, and was joined by one other that was still partly in the egg (Figure 11). These two were placed back in the jug, which in turn was placed in a cooler for the ride to Tempe. The bucket with the nest soil also came with, to be used as Dale deemed fit.

Dale's wife Dianne also joined us for the processing. As Dianne is a nurse by profession, we had quite the A-Team assembled. As each hatchling was processed, it received a number that became law—both going back and forward. We were more focused on getting all the metrics down accurately for each monster than in numbering them according to when they dropped into the water jug. When all was said and done, numbers 1, 4 and 5 were the three that were in the jug when I arrived at the nest site. Numbers 2 and 3 were the two collected while I was there. Until this project reaches its conclusion, they will retain the numbers that we gave them that day.

Each of the hatchlings was processed for mass, snout–vent length (SVL), and tail length. Each was then photographed from four different angles: top, bottom, left side and right side. In order to maintain consistency with the measurements, this author (a machinist by trade) manned the ruler. For the sake of safety, most of the handling of the smart end of the Gilas was performed by Dale, with the occasional assist from this author. Dianna and Dianne assisted with the handling when needed, photographed everything that was transpiring, and acted as scribes for the data collecting. Dianne's skills as a nurse were required with the sticky situation that developed with number 5. But we get ahead of ourselves by saying so.

The first three animals processed were chosen in random fashion, while we deliberately passed by number 4 and number

5. Number 4 was the one still entirely inside its egg, and we at first ignored #4 while we decided whether to remove it from the egg for processing, or wait until a later date when it emerged. Number 5 was in trouble, and we were saving that one for last so that we could fully focus on it without distractions. By the time we got to number 4, we decided that we could not likely pull together a better processing team, and methodically worked it out of the egg. The vital stats of the first four hatchlings processed ranged from 27.23 to 33.47 grams in mass. The SVLs ranged from 123 to 126 mm, and the tails were from 46 to 51 mm long. As of the date of this writing, the sex ratio has yet to be determined. Rather than going into a blow-by-blow account of the processing, we will go with images and captions for descriptions of each (Figures 12–18).

This brought us to number 5. We first mention that after all the steps to resurrect # 5 had occurred, it had a mass of 23.31 grams (~7 grams less than the average), an SVL of 128 mm (the longest of the five), and a tail length of 51 mm (tied for the longest). Before going into further details of the rescue of this one, we first remind the readers that these hatchlings were unearthed by a backhoe, operated by somebody who was unaware of the presence of the nest. That all five of these hatchlings were not mangled by the process is remarkable. Add to the scenario that this particular monster was delivered into the hands of one of the few people in the world who could fix it, and we go beyond fortuitous to enter the realm of miraculous. Upon removing #5 from the water jug, it was discovered that the matted bloody tissue connecting the Gila to the egg shell was a drying umbilical cord and a roughly 6 mm loop of intestine that was herniated through the now-sealed umbilicus. The umbilicus, intestine, and somewhat mangled eggshell were adhered to each other by dried albumen, and this mess was alongside the drying and sand-infested yolk in a gelatinous mass among the shell (Figure 17). Dianne scrambled away from the scene to find some sterile saline solution and surgical instruments, while Dale tacked down some antibiotics, a syringe, and suture. The short story is that 30 seconds later, the wounded area was thoroughly cleaned, disinfected, the umbilicus opened to free the intestine, which was deftly tucked back into place and stitched up. At the date of this writing, all five hatchlings are in great health, are feeding on pinkie mice, and ready for whatever comes next (Figure 18).



Figure 12. All remaining images are of the processing that occurred on 30 October 2016. This is number 1. Nothing remains of the yolk in the egg, yet the umbilicus remains attached. Image by Dianna Repp.



Figure 13. Number 2, found in the soil mound tailings above the trench. It was not connected to the egg when found. The short length of the umbilicus might indicate that this one was already out of the egg when the dig transpired. Image by Dianna Repp.



Figure 14. Right side view of number 3, also found free of the egg in the tailings above the trench. Image by Dianna Repp.



Figure 15. Number 4, finally starting to emerge from its egg. Note the various stages of hatching exhibited by these Gila Monsters. Image by Dianna Repp.



Figure 16. Number 4, showing defiance before it is even out of the egg. Image by Dianna Repp.



Figure 17. Despite the fact that all five hatchlings were dug out of the nest with a backhoe, only number 5 sustained any damage. But the injury was minor, and was quickly rectified by the skilled hands of the good Dr. DeNardo. See text for details. Image by Dianna Repp.



Figure 18. All five hatchlings post-processing. At the date of this writing, all the hatchlings are feeding and doing well. Image by Dianna Repp.

Speaking of what comes next, what *does* come next? Thus far, it has been our intent to wait until May, and then release them back near their nesting site. This is why I thought it prudent to gather some of the nest soil when taking these animals from their home. While we are still in our infancy in understanding the importance of nest imprinting with Squamata, this author is convinced that the first few tastes of the ground they are born on might play a critical role in their survival. However, as much as the notion of putting them back where they came from is appealing, I am also acutely aware that these hatchlings might better serve science by remaining captive. They are the first-ever wild born hatchlings in hand, and the possibilities of their usefulness to science are limited only by our imaginations. My own thoughts center on at what point their coloration scheme changes, as well as at what point their hatchling patterns morph into the permanent patterns that they will carry as adults. The bottom line is that as long as we retain them, the sky is the limit with their usefulness. Once they are released, any further opportunities to learn something from them are gone. If we do release them, I will see to it that microchips are part of the process. But I am otherwise content to leave their future in the hands of DeNardo and company.

The DeNardo lab intends to combine everything just described to the readers of this publication as part of a much larger paper. Of the many studies of Gila Monsters done in Arizona, the DeNardo lab did the most thorough job of documenting the nest sites of many different monsters, and even radio-tracked some of the hatchlings. When their paper is finally published, it will be *the* definitive work on the reproduction aspects of Gila Monsters in their wild state. It is my hope that the additional

information provided by this event will be the spark that inspires them to publish their findings sooner rather than later.

My own take on what to do with this event was that it was a stand-alone article from the second I laid my eyes on the hatchlings in the water jug. Whether it occurred in a semi-urban environment or not, *nobody* has ever documented what has just been described here. And as unlikely as it may seem, another nest might be uncovered in the near future. To wait any longer is to risk losing the prize of being the first to report it. It was with some hesitancy that I approached Dale to seek his blessing to proceed with this write-up. I am grateful that he was willing to turn me loose. To be sure, his efforts will result in a much more solid contribution to science, and will be packed with scads of data from multiple sources. I earnestly look forward to this paper being published.

My good fortune in being involved with this event is the pinnacle of my avocational career in herpetology. My whole reason for radio-tracking Gila Monsters for 13 years was to be the first to find something like this. When I finally pulled the plug on them, it was a form of admitting defeat. To have it all just fall in my lap several years later was the result of more luck than brains. I'm pleased and proud to publish this event in the *Bulletin*. It will doubtless be my greatest contribution to herpetology, and I'm ecstatic to give it to the group that got me started with my passion in the first place. While my life is hopefully far from over concerning my contributions to herpetology, this will be hard to top. It just doesn't get any better than this.

This here is Roger Repp, signing off from Southern Arizona, where the turtles are strong the snakes are handsome, and the lizards are *way* above average.

Minutes of the CHS Board Meeting, December 16, 2016

President John Bellah called the meeting to order at 7:40 P.M. Board members Aaron LaForge, Amy Sullivan and Jessica Wadleigh were absent.

The minutes of the November 18 board meeting were read and accepted.

Officers' Reports

Treasurer: Mike Dloogatch read the report submitted by Amy Sullivan.

Corresponding secretary: Amy Bochenko has sent thank-you letters to all of the symposium speakers.

Membership secretary: Mike Dloogatch read the list of expiring memberships. He has also provided memberships or membership extensions to all symposium speakers.

Committees

Jr. Herpers: Eighteen children and 15 adults attended the December meeting. The January topic is to be winter herps. Nathan Kutok will be presenting. Colleen is in contact with the Notebaert regarding having the children display their animals in the

museum. They are also considering a camping trip.

ReptileFest: John Archer needs someone to coordinate the Herps of Illinois exhibit. Andy Sagan may want the organizing committee to meet in January.

Old Business

Adoptions fund: Mike Dloogatch moved that the restricted adoptions fund be eliminated and the balance be dispersed as follows: \$3000 to Linda Malawy and \$4488.29 to Bob Bavirsha as to reimburse them for unclaimed reptile care expenses. The motion passed unanimously.

Pop up Banners: Dick Buchholz will send photos to Kim Klisiak. The proposed signs will be 3 × 6 feet.

New Business:

Zoo trip: John Bellah plans to organize a trip with a behind-the-scenes tour sometime during the coming year.

The meeting adjourned at 9:00 P.M.

Respectfully submitted by recording secretary Teresa Savino

Minutes of the CHS Board Meeting, January 13, 2017

President Rich Crowley called the meeting to order at 7:30 P.M. Board members Mike Scott and Jessica Wadleigh were absent.

The minutes of the December 16 board meeting were read and accepted.

Officers' Reports

Treasurer: Andy Malawy went over the year-end financial report. He reported that all restricted funds have been eliminated. John Bellah has been paying the \$20 monthly fee for the Meet-up app. He does not want reimbursement; however, the payment will now be charged to the Society.

Membership secretary: Mike Dloogatch read the list of expiring memberships. Current membership stands at 443.

Sergeant-at-arms: Attendance at the December general meeting was 27.

Media secretary: Morgan Lantz needs access to all media to be able to update and post. Brandon Ottolino needs photos for the Instagram account (does not want to continue to post only his own).

Committees

Shows: Dick Buchholz read the list of upcoming shows. He hopes to get the list of shows on the CHS website.

Jr. Herpers: Rich Lamszus and Lisette Chapa reported 30 people at the January 8 meeting: 17 children and 13 adults. Nathan Kutok (15 years old) spoke about winter herping. Dan Bavirsha

will speak at the February meeting.

Adoptions: Linda Malawy would like help to organize and maintain a list of what members are looking to adopt. She needs this because she does not want to take animals in if she does not know that she can find a forever home for them.

Old Business

Grants: Mike Dloogatch moved to authorize the CHS Grants Committee to give out up to \$10,000 in grants in 2017. Linda Malawy seconded. The motion passed unanimously.

Pop-up banners: The board still needs to see pricing and a mock-up.

DaSueDesign: The owner is looking to donate a portion of her sale of reptile bracelets to the Society; she'd like to have our logo on her website with a statement that a portion of the sale is donated to the CHS. John Bellah has volunteered to look into this.

New Business:

Setting up the framework for the future of the CHS—make it fun!! What are members' thoughts on the future of the Society? Look into changing the Insurance policy expiration date to late October or November.

Gail will send out thank-you letters to two year-end donors.

The meeting was adjourned at 9:33P.M.

Respectfully submitted by recording secretary Gail Oomens

Herpetology 2017

In this column the editorial staff presents short abstracts of herpetological articles we have found of interest. This is not an attempt to summarize all of the research papers being published; it is an attempt to increase the reader's awareness of what herpetologists have been doing and publishing. The editor assumes full responsibility for any errors or misleading statements.

SIDEWINDER FEEDING ECOLOGY

M. M. Webber et al. [2016, *Herpetologica* 72(4):324-330] note that dietary studies are important for understanding predator-prey relationships and species interactions because they provide information on the trophic resources available to predators and their potential impact on prey populations. The authors relied on stomach contents of museum specimens and literature records to examine ontogenetic, sexual, seasonal, and geographic variation in the feeding habits of sidewinders, *Crotalus cerastes*. Sidewinders fed primarily on lizards and slightly less frequently on mammals; birds and snakes were rarely consumed. The vast majority of *C. cerastes* consumed single prey items ingested head-first. Juvenile and adult female sidewinders consumed lizards and mammals with similar frequency. An ontogenetic shift was seen in feeding patterns of male *C. cerastes*: adult males included more mammals in their diets than juvenile males. Sidewinders are classic sit-and-wait predators and, as predicted by theory, actively foraging lizards and mammals comprise a considerable fraction of their prey. The study documented seasonal shifts in sidewinder feeding patterns, with snakes consuming a greater proportion of lizards during early spring and autumn, and a greater percentage of mammals during late spring and summer. This dietary shift likely results from seasonal changes in the activity patterns of *C. cerastes*, because individuals can be diurnally active during early spring and autumn but are predominantly nocturnal during late spring and summer. Adult sidewinders from the Mojave and Sonoran deserts consumed similar proportions of lizards and mammals. These findings regarding the trophic habits of *C. cerastes* contribute to understanding the ecology of terrestrial, venomous predators.

SEX DETERMINATION IN CHAMELEONS

C. J. Ballen et al. [2016, *Journal of Herpetology* 50(4):548-551] report that classifying a species as having either genotypic or environmental sex determination may oversimplify the processes that influence offspring sex. Using two independently gathered data sets on veiled chameleons (*Chamaeleo calyptratus*), the authors show that a hatchling's sex is affected by the interaction between egg mass and incubation temperature. In both studies, larger eggs produced daughters at lower temperatures and sons at higher temperatures; however, the relationships between incubation temperature, egg mass, and sex diverged markedly between the two studies. The shift in egg-size effects was seen between 25°C and 28°C in one study and between 28°C and 30°C in the other. The links between offspring size, sex, and incubation temperature are not an artifact of differential mortality; in one of the studies, egg survival rates were uniformly high. Other data on scincid and agamid lizards also do not support a simple dichotomy in sex-determining systems. These results challenge simplistic classificatory schemes and call for a re-analysis of existing data sets to look for multifactorial as well as unifactorial effects on offspring sex.

ALLIGATORS IN NORTH CAROLINA

B. Gardner et al. [2016, *Journal of Herpetology* 50(4):541-547] note that populations of American alligators (*Alligator mississippiensis*) generally are considered more abundant at present than historically; however, little information exists to assess the population of alligators in North Carolina at the northern extent of the species' range. Investigation of the factors influencing the distribution and abundance of alligators in North Carolina could shed light on the species' response to rapid environmental change in the region. The authors conducted a two-phase study: 1) to assess the distribution of alligators in North Carolina using a site-occupancy design; and 2) to assess the patterns in abundance using a repeated sampling design for population estimation. Results showed that both occupancy and abundance decreased in more northern sites, in sites with higher salinity, and in sites that were generally more westward. Sites sampled later in June were more likely to be occupied than those sampled earlier in the month. Abundance also increased with greater shoreline vegetation complexity and varied between lakes, rivers and estuaries. Compared with studies from 30 years prior, the population seems fairly stable in terms of abundance and distribution. Given the northern limits of the species and the negative association with salinity, continued monitoring is warranted to understand changes in distribution and abundance with respect to predicted rates of sea-level rise, salinization, and urbanization locally around coastal cities like Wilmington.

EFFECTS OF PREY ON HEAD WIDTH

B. E. Carlson and T. Langkilde [2016, *Journal of Herpetology* 50(3):442-448] note that for gape-limited predators, investment in larger heads should occur when larger prey items are more profitable or are the only prey option available. This may result in evolutionary or within-lifetime (plastic) increases in gape size in animals exposed to larger prey. This phenomenon has been well documented in larval but not adult salamanders and newts. The authors report evidence of greater gape size in populations of a newt that co-occur with energetically profitable, large prey. They collected morphological data from populations of red-spotted newts (*Notophthalmus viridescens viridescens*) that occupied nearby ponds that varied in the presence of eggs and tadpoles of wood frogs (*Lithobates sylvaticus*). Newts were larger in ponds occupied by wood frogs, suggesting a potential energetic advantage to this prey. Newts syntopic with wood frogs had relatively wider heads, which we interpret as a potential adaptation for consuming seasonally abundant wood frog eggs and tadpoles. Male newts had wider heads than did females, suggesting sexual selection also may act on head or gape width in newts. These findings suggest that adult newts exhibit either phenotypic plasticity in gape width or microgeographic local adaptation in response to variation in food resources. Additional work examining this in other caudates may reveal it to be a phenomenon widespread in adults as well as larvae.

Advertisements

For sale: **highest quality frozen rodents.** I have been raising rodents for over 30 years and can supply you with the highest quality mice available in the U.S. These are always exceptionally clean and healthy with no urine odor or mixed in bedding. I feed these to my own reptile collection exclusively and so make sure they are the best available. All rodents are produced from my personal breeding colony and are fed exceptional high protein, low fat rodent diets; no dog food is ever used. Additionally, all mice are flash frozen and are separate in the bag, not frozen together. I also have ultra low shipping prices to most areas of the U.S. and can beat others shipping prices considerably. I specialize in the smaller mice sizes and currently have the following four sizes available: Small pink mice (1 day old—1 gm) , \$25 /100; Large pink mice (4 to 5 days old—2 to 3 gm), \$27.50 /100; Small fuzzy mice (7 to 8 days old—5 to 6 gm) , \$30/100; Large fuzzy mice /hoppers (10 to 12 days old—8 to 10 gm), \$35/100 Contact Kelly Haller at 785-234-3358 or by e-mail at kelhal56@hotmail.com

For sale or trade: Probable pair of albino Harquahala rosy boas. They were born in my home in late 2016 and are feeding on f/t peach fuzz mice. Pure locality animals exhibiting a recessive gene. Viewing is possible, parents on site. I can drive to meet a reasonable distance, or ship if you are not local. Discount if you pick them up from my home. Cash, credit card or PayPal. Call or text 510-318-1715, or email elenabmoss@gmail.com.

Herp tours: **Costa Rica herping adventures.** Join a small group of fellow herpers for 7 herp-filled days. We find all types of herps, mammals, birds and insects, but our target is snakes. We average 52 per trip, and this is our 10th year doing it. If you would like to enjoy finding herps in the wild and sleep in a bed at night with air-conditioning, hot water and only unpack your suitcase once, instead of daily, then this is the place to do it. Go to our web-site <http://hiss-n-things.com> and read the highlights of our trips. Read the statistics of each trip and visit the link showing photos of the 40 different species we have found along the way. E-mail at jim.kavney@gmail.com or call Jim Kavney, 305-664-2881.

Line ads in this publication are run free for CHS members — \$2 per line for nonmembers. Any ad may be refused at the discretion of the Editor. Submit ads to mdloogatch@chicagoherp.org.

From the company that developed the **first UVB lamp** for reptiles 20 years ago...

T5 HO UVB



NEW

2x the UVB & Light Output!



**European Quality
Made in Germany**



Only 1 1/8" thick

**Low Profile
T5 HO Terrarium
Hoods Available**



ZOO MED LABORATORIES, INC.
3650 Sacramento Dr.
San Luis Obispo, CA 93401 U.S.A
Email: zoomed@zoomed.com

www.zoomed.com

News and Announcements

2017 CHS GRANT RECIPIENTS

The CHS Grants Committee has chosen the CHS grant recipients for 2017. The committee consisted of John Archer, Michael Dloogatch, Robert Jadin, Linda Malawy, Sarah Orlofske and Jessica Wadleigh. This year we received 31 applications. After a difficult decision process, ten grants were awarded, as follows:

- Davinia Beneyto Garrigos, Department of Biodiversity, Conservation and Evolution, University of Valencia, Spain. “Hormone Disruptors: Geographic Distribution of Sex Ratio Biases of the American Crocodile (*Crocodylus acutus*),” \$1,000.
- Andrew Frank, Department of Ecology and Evolutionary Biology, University of Connecticut. “Testing the Adaptive Nature of Juvenile Tail Color Morphs in a Western North America Skink,” \$1,000.
- Harrison Goldspiel, Department of Environmental and Forest Biology, SUNY College of Environmental Science and Forestry. “The Contribution of Aquatic Versus Terrestrial Habitats in Regulating Populations of Amphibians with Complex Life Cycles,” \$1,000.
- Sean Harrington, Department of Biology, San Diego State University. “A 3-D Geometric Morphometric Approach to Rattlesnake Cranial Evolution,” \$1,000.
- Chace Holzheuser, Department of Biology, University of Maryland. “Chasing Shadows: Quantifying Changes in Distribution and Occupancy of the Southern Dusky Salamander (*Desmognathus auriculatus*) in Florida,” \$1,000.
- Eric B. Liebgold and Tami S. Ransom, Department of Biological Sciences and Department of Environmental Studies, Salisbury University. “Genetic Diversity and Population Connectivity of the Spotted Turtle (*Clemmys guttata*), a Species of Conservation Concern,” \$1,000.
- Diego A. Ortiz, College of Science and Engineering, James Cook University, Townsville, Australia. “Systematics and Biogeography of the Slender-legged Tree Frog (*Osteocephalus taurinus*) Species Complex in the Amazon Basin,” \$1,000.
- Mallery Rae Parker, Undergraduate, University of Arizona. “Conservation Genetics of the World’s Largest Frog (*Conraua goliath*) in Cameroon,” \$1,000.
- Nicolette Roach, Applied Biodiversity Sciences & Wildlife and Fisheries Sciences, Texas A&M University, “Using bioacoustics to assess the distribution, vulnerability, and conservation of five IUCN threatened *Atelopus* species in the Sierra Nevada de Santa Marta, Colombia,” \$1,000.
- Christopher Smaga, Undergraduate, Southern Illinois University. “Impact of Snake Fungal Disease (*Ophidiomyces ophidiicola*) in Southern Illinois,” \$1,000.

News and Announcements

SHOW SCHEDULE

In addition to ReptileFest the Chicago Herpetological Society puts on many live animal displays throughout the year. The events now scheduled for March through June are listed below. CHS members who wish to participate in an event should call or text ahead to Show Coordinator Dick Buchholz, 805-296-9516, to confirm.

- Notebaert Nature Museum, first full weekend of each month, Saturday and Sunday, 10 A.M. – 3 P.M.
- All Animal Expo, first Saturday & third Sunday of each month, 10 A.M. – 3 P.M., Dupage County Fairgrounds, Wheaton.
- Arlington Pet Show, March 17–19, Friday Noon – 9 P.M., Saturday 9 A.M. – 9 P.M., Sunday 10 A.M. – 5 P.M., Arlington Park Racetrack, Arlington Heights.
- NARBC, March 18–19, Saturday 10 A.M. – 5 P.M., Sunday 11 A.M. – 4 P.M., Tinley Park Convention Center, 18451 Convention Center Drive, Tinley Park.
- Kids Expo 2017, March 31 – April 2, Friday 3 P.M. – 9 P.M., Saturday 9 A.M. – 5 P.M., Sunday 10 A.M. – 5 P.M., Renaissance Schaumburg Convention Center, Schaumburg.
- Chicago Pet Show, April 29–30, 10 A.M. – 5 P.M., Oak Lawn Community Pavilion, Oak Lawn.
- WellBatavia (formerly Green Fair on the Fox), June 3, 8 A.M. – 2 P.M., Peg Bond Center, Batavia.
- Rockin' for Reptiles, June 24, Midwest Museum of Natural History, Sycamore.
- Greek Festival, June 24–25, 3 P.M. – 9 P.M., Greek Orthodox Church, Palatine.

We've been doing it right for over 20 years

We're not stopping now

ReptileFest 2017

April 8, 9 2017

Northeastern Illinois University

Athletic Complex

3600 W. Foster Avenue

You're not going to miss it!

UPCOMING MEETINGS

The next meeting of the Chicago Herpetological Society will be held at 7:30 P.M., Wednesday, February 22, at the Peggy Notebaert Nature Museum, Cannon Drive and Fullerton Parkway, in Chicago. Current CHS president **Rich Crowley** will present a program about his “Passionate Journey with Short-tailed Pythons.” Rich has been keeping short-tailed pythons since 1997, focusing on Borneo pythons (*Python breitensteini*) and blood pythons (*Python brongersmai*). He is the Budget Officer at Argonne National Laboratory, a past president of the Lewis University Alumni Association and is a published fantasy novelist (check it out on Amazon.com).

The speaker at the March 29 meeting has not yet been confirmed.

The regular monthly meetings of the Chicago Herpetological Society take place at Chicago’s newest museum—the **Peggy Notebaert Nature Museum**. This beautiful building is at Fullerton Parkway and Cannon Drive, directly across Fullerton from the Lincoln Park Zoo. Meetings are held the last Wednesday of each month, from 7:30 P.M. through 9:30 P.M. Parking is free on Cannon Drive. A plethora of CTA buses stop nearby.

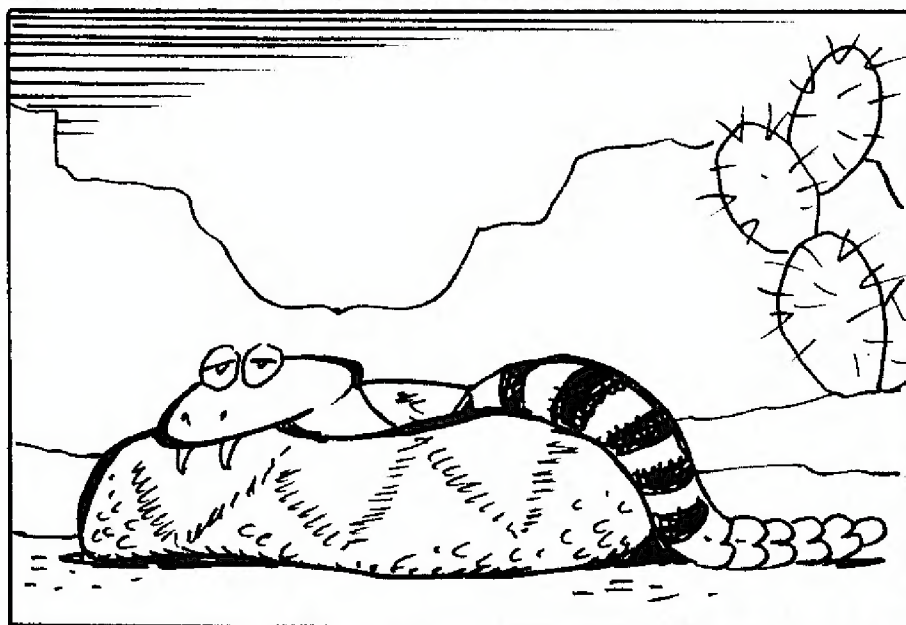
Board of Directors Meeting

Are you interested in how the decisions are made that determine how the Chicago Herpetological Society runs? And would you like to have input into those decisions? If so, mark your calendar for the next board meeting, to be held at 7:30 P.M., Friday, March 17, 2017, at the Schaumburg Township District Library, 130 S. Roselle Road, Schaumburg.

The Chicago Turtle Club

The monthly meetings of the Chicago Turtle Club are informal; questions, children and animals are welcome. Meetings normally take place at the North Park Village Nature Center, 5801 N. Pulaski, in Chicago. Parking is free. For more info visit the group’s Facebook page.

THE ADVENTURES OF SPOT



Periodicals Postage
Paid at Chicago IL

CHICAGO HERPETOLOGICAL SOCIETY

Affiliated with the Chicago Academy of Sciences

2430 North Cannon Drive • Chicago, Illinois 60614
